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# THE BRASS WORLD AND PLATERS' GUIDE

A JOURNAL
DEVOTED TO THE
ART OF REFINING,
ALLOYING, CASTING,
ROLLING, FOUNDING,
AND ELECTROPLATING
OF ALL THE
NON-FERROUS
METALS

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EDITED BY
ERWIN S. SPERRY

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# THE
# BRASS WORLD
# AND
# PLATERS' GUIDE

VOL. IX. BRIDGEPORT, CONN., JANUARY, 1913. No. 1.

**A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.**

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## Sulphur as Cause of Black Skin on Brass and Composition Castings.

The influence of sulphur on brass and composition sand castings seems to be as little understood as any of those to which they are subject. It is one of the elements rarely determined by the chemist and it is generally considered as a substance inert and not worth taking into consideration. It is not so, however, and sulphur is an element that should be carefully watched, if any supervision of the metal is to be undertaken, as some of the mysterious and accompanying troubles of the brass foundry may be laid at its door.

Sulphur causes three difficulties in sand castings:

1. Blowholes in the castings.
2. Dirty metal.
3. Dark or black skin on the surface of the castings.

It is believed that much of the difficulty experienced from the use of scrap metals is really due to sulphur. Users frequently say: "We have had such and such an ingot metal analyzed and it comes up to specifications, but we cannot use it. The castings are not like those made from new metals." The reason for this is that whoever made the analysis apparently overlooked the sulphur and it would probably have been found in the ingot metal made from scrap and not in the new material; and it would account for the difference. The chemist was to blame.

G. H. Clamer, the well known metallurgist, in his paper on the "Electric Melting of Copper and Brass," makes the following remarks in regard to the influence of sulphur on brass and copper:

"I am firmly of the opinion that many of our failures, which we have ascribed to oxygen, are in reality, due to sulphur. I have made some investigations along these lines, and have found that in the most careful crucible melting in coke fired furnaces, that the metal will take up from 0.02% to 0.05% of sulphur. Copper has the greatest affinity for sulphur of any of our metals, outside of manganese, and naturally, it tends to absorb it if brought in contact with sulphur carrying gases. Sulphur accumulates each time the metal is melted, and this accounts for the dark skin on re-run castings, as compared with those of first melt metal."

These remarks are very pertinent to the case and indicate that sulphur is an injurious element in brass. The oft-repeated statement that "scrap is not as good as new metal" seems to depend entirely upon the sulphur content. Much of the scrap on the market has been melted over and over, how many times, cannot be ascertained, but the fact remains that each time it is melted, it absorbs sulphur and does not part with it. If new metal and scrap show the same chemical analysis, then they are the same for copper is copper and tin is tin. If a chemist fails to report sulphur and the analysis of each is, therefore, identical, then it is not surprising that consumers make the above statement.

We advocate, therefore, that sulphur be one of the elements taken into consideration in specifications as it has a far greater influence on sand castings than is generally appreciated.

## Why Copper is Always Present in Silver Plating Solutions.

It is usually appreciated by silver platers that more or less copper is always present in a silver plating solution, particularly if it has been in use for some time. It is usually believed that this comes from a little of the "strike" entering the solution, or from the stringing wires or from sources other than the real one. The fact is, nearly all the copper comes from the anodes and investigation has shown this to be the case.

No metals are ever produced commercially in the chemically pure condition. It is an extremely difficult matter to produce them and the cost is very high; but commercial silver anodes are purer than any other commercial metal and it is not difficult to make them so, as far as metallurgical operations go. It is necessary, too, to do this as the anodes will turn black if not made of this kind of silver and platers will not use them.

Copper is always present in silver to a greater or less extent and is called a "harmless" impurity. Its presence in small amounts does not affect the silver for the manufacture of sterling or for anodes. In the anodes, it dissolves in the cyanide when the current is passing and does not cause the formation of any black slime on them or any discoloration. In fact, its presence in the silver anodes will never be known by a plater.

It should not be understood that silver anodes contain much copper. As a matter of fact, they contain very little. Commercial silver is always over 999 fine which means that there is only 1 part of impurity in a thousand parts. This may be a number of metals and only a portion of which is copper. The silver in silver anodes is of far greater purity than 999 fineness, but even so, a minute quantity of copper is *always* present. We have never seen any samples in which copper could not be detected. It is the copper in the anodes which is the cause of the copper in the silver plating solutions.

Now comes the peculiar part of the matter. Copper, when present in a silver plating solution, does not deposit with the silver as many platers believe. This fact was worked out some time ago by English investigators who found that the copper does not deposit at the current density used in the electrodeposition of silver, but simply remains in the solution. At a higher current density than is ever employed in silver plating, it deposits, but this never takes place in ordinary work.

The copper then, as it comes from the anodes, enters the silver plating solution and remains there. No matter how small an amount may be in a silver anode, it enters the solution, and as the anode wears away, the copper keeps on increasing from day to day, and is not removed. When one stops to consider that many silver plating solutions have been in use for years and the copper from all the anodes used, even though a minute percentage, enters the silver plating solution, the amount which may accumulate in it can be realized.

# The Charcoal Furnace of the East Hampton, Connecticut, Bell Makers; Its History, Uses and Advantages.

By Erwin S. Sperry.

Almost in the center of the State of Connecticut lies the little village of East Hampton, a typical country town of a few thousand inhabitants. It is one of those communities where peace and quietness reign and the only disturbing element is the busy hum of the wheels in the few factories which have made the village famous. New England is full of such villages and they have been the cause of its early manufacturing supremacy and the good name that has followed many a product that has gone broadcast over the world. The little town of East Hampton is one of these villages, where everyone has "put his shoulder to the wheel" and helped to make the good name it bears; and to keep the name, which is far more difficult, than to make it. When one discovers the loyalty and interest displayed by those who are employed in the East Hampton mills, it is not surprising that it has been possible to build up the enterprises that now exist in East Hampton and to bring to it its well earned name of the "Bell Town of America".

The Yankee has always been famous for his ingenuity and the early inventions made in this country were mainly those of his brain. The Connecticut Yankee has always been considered the principal one of the "species" and the enormous number of ingenious things that he has invented and constructed easily bear witness to this fact.

There is probably no section of Connecticut where Yankee ingenuity has been more paramount than in East Hampton. A man is always known by his deeds and a Yankee is known by his products. When one has seen the products that are made in this little town and the manner of making them, he may wonder at their variety and why it has been

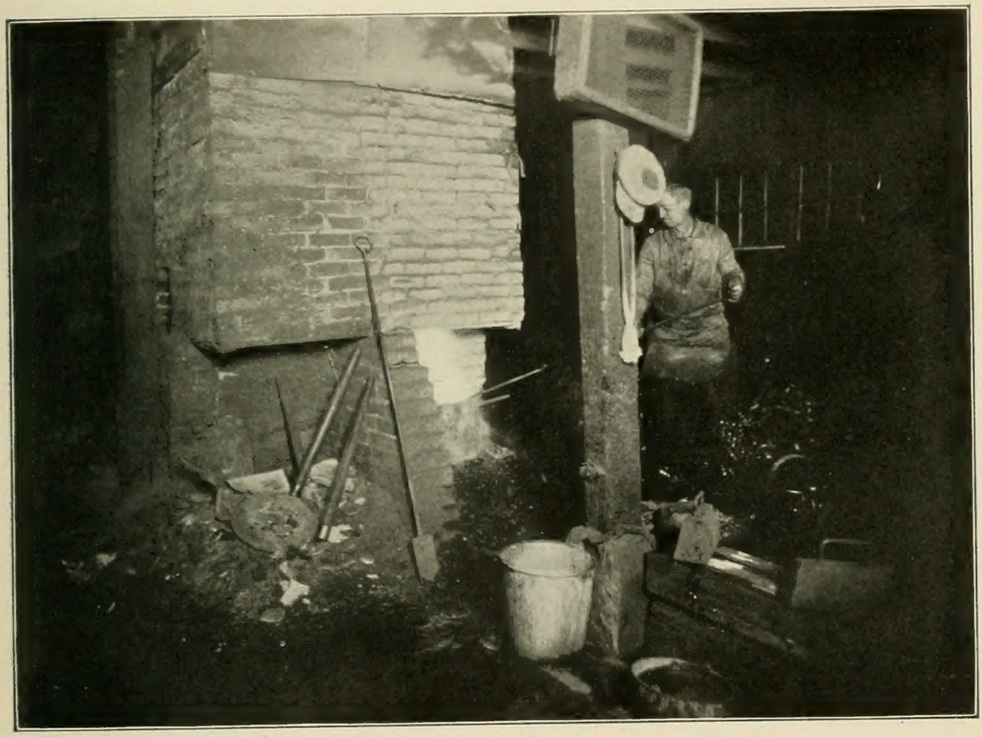

Fig. 1. Charcoal Bell Furnace at East Hampton Bell Company, East Hampton, Conn. By Means of This Furnace, Yellow Brass is Converted Into Fine, Red Bell Metal.

possible constantly to maintain the supremacy, or one might say, monoply of the manufacture of bells. It has been done for many years and is being done today in this little village and all the mills have prospered and made money.

In East Hampton, or the "Bell Town" as it is usually called, nearly all the bells, with the exception of church and other large bells, produced in the United States are here manufactured. Bells of hundreds of diffierent patterns, from the smallest sleigh bell to the largest gong used in fire department service, are made daily. For years, before the advent of sheet steel stampings, all bells and gongs were cast, but it has been found possible to make bells so cheaply from sheet steel that it is now extensively employed and the East Hampton manufacturers have kept abreast of the time and are equipped for making them. To some extent it has replaced the more costly bronze bell, but not entirely as a steel bell does not have the tone of a cast one, and in addition it soon rusts, no matter how carefully it may have been plated. Its cheapness, however, has been instrumental in producing a large and growing demand, but the demand for cast bells has likewise increased so that there are probably as many bronze bells manufactured as ever before.

To the outside world, East Hampton has been famous for its bells. To the initiated, its charcoal furnace used for melting the bell metal, has been more remarkable. If there has been any one thing that has contributed to the success of the town, it has been the charcoal bell furnace. It was the original method of melting the bell metal, and it is still used by all the manufacturers in the village. As far as known, it is not used in any other part of the entire world and the "charcoal bell furnace" of the East Hampton bell makers has stood for years as novel and unique. That it will do remarkable things needs but one demonstration to convince the most skeptical mind, and there has never been one instance in which an outsider has watched it, that he did not marvel at it. Few people know of its existence, although it has been in East Hampton for nearly a century and has never been considered a secret. The bell makers of this town frequntly state that other people outside of their village have attempted to use the furnace but have failed. To be sure, it requires a little special knowledge gained by experience, in running the furnace, and this is probably why it is confined exclusively to East Hampton.

**Fig. 2. The Village of East Hampton, Conn., in Which are Manufactured Nearly All the Small Bells Made in the United States. It is Frequently Called the "Bell Town."**

Workmen rarely leave this town and what knowledge they possess is confined in it.

One of the most interesting natural features of the village of East Hampton is the little lake which lies among the hills a little north of the main portion of the town. This body of fresh water is called Lake Pocotopaug and it rightly may be said that it has been as instrumental in bringing about the success of the East Hampton bell makers more than anything else for it supplies the power to run their mills. The water in this lake is as clear as crystal and in Fig. 3 one may see its appearance. Situated as it is, on a high portion of the land, the water running from it furnishes good power for the manufacturers. It was this very water power that gave East Hampton its inception and, like many other New England villages, mills located where power could be obtained. Steam engines had not then made their appearance.

Fig. 3. Lake Pocotopaug in East Hampton, Conn., from Which the Water is Obtained to Operate the Mills in the Town.

Before entering into a description of the charcoal furnace for melting the metal from which the bells are cast, let a little history of the manufacture of these articles in East Hampton be interspersed. The first man to make bells in this town was William Barton, grandfather of Joseph D. Barton, one of the oldest inhabitants of the place and a veteran of the Civil War. William Barton started to make cast bells in 1808 and at first the furnace was run by means of an ordinary blacksmith's bellows. Indeed, in some of the shops in the town, such bellows still remain and indicate that they have been in comparatively recent use. Perhaps, they were retained as a safeguard in the dry summer months when often there is not sufficient water to supply power. Now the mills are equipped with auxiliary steam engines for supplying power when the water fails as the lake is not infallible and the overflow is all that can be used for power.

The blacksmith's bellows used for supplying air to the charcoal furnaces was not blown in the manner usually practiced at the present time, but a hand wheel was employed to run it. William Barton's bell foundry was in the middle of the village and J. D. Barton, his grandson, states that he was employed for some time to turn the wheel at the sum of seventy-five cents per day. Prices for labor [illegible] to the statement of Mr. Barton in regard to the prices charged by Dr. Eggleston, who for years was the only physician in East Hampton. This doctor charged twenty-five cents a visit except when he happened to be passing the house where his services were desired, when but twelve and a half cents was charged for medical attendance.

The wheel and bellows method of blowing the charcoal furnace was used for some time and then horse-power supplemented hand power. At that time the cast sleigh bells were made in two parts, the ball inserted and the halves soldered together. William Barton found this could be improved and he was the inventor of the method now in use of placing a little iron ball inside of the core, used for casting the bells and then casting them solid. The bells, after casting, are cut from the gate and tumbled to remove the core, when the iron ball, of course, is left in the casting. This method of casting marked a great improvement in the manufacture of sleigh-bells.

The bell foundry in which William Barton cast his first bells was located on a hill and water power was not used on account of the impossibility of utilizing it. Later mills located on the small brook or creek which represents the overflow from Lake Pocotopaug. This water power is a very peculiar feature of the town and as a usual rule, there is scarcely enough water to operate one factory. Strange to say, this feature has been offset by the various mills using the same water. When it flows from the water wheel of one, it passes down the hill to the next one and so on. Each mill is located below the other so that the water is utilized by all without any difficulty whatever. As the water flows from the lake, it is first utilized by Bevin Bros. and then, flowing down the hill a little ways, is claimed by the Starr Bros. Bell Co. Next the East Hampton Bell Company and the Gong Bell Company harness it for the power they require. The Watrous Mfg. Co. now has it for a time until finally, the N. N. Hill Brass Co. obtain the final advantage of it. All of these concerns make bells and have been in existence a long time. Water power has been instrumental in building up their business, and they still use it.

One of the oldest bell makers in East Hampton is the East Hampton Bell Co. whose factory is shown in Fig. 4. It was started in 1830 and has still continued in the possession of the Goff family. George Goff, the able general manager of the company, granted permission to inspect the charcoal furnace at the foundry of this company and to take the photographs that are herewith shown.

### *The Charcoal Furnace.*

The charcoal furnace used by the East Hampton bell makers stands unique in that so far as known, nothing like it is in use by any other establishment in the world. One might think it a relic of the past, but when one watches its operation, he at once becomes convinced that it has much merit. When it is possible, as it is in this furnace, to melt down a lot of yellow scrap brass, full of iron and dirt, and obtain clean, red metal castings, then one ceases to ridicule it. Here such scrap material as old clocks, springs, pinions, studs and all the iron in them, without removing any of it, is melted down and red metal results. Red metal is always obtained and it is always good. The bell castings obtained from it are the equal of any ordinary composition castings made and superior to this material. They come out of the sand with a uniform red color and with a surface clean and bright. The bells always have the same ring and it is possible to carry on this uniformity day in and day out, no matter what the scrap is.

In Fig. 1 a general view of the furnace and foundry of the East Hampton Bell Co. is shown. The molder melts his own metal and looks after the furnace entirely. No helper is needed.

A brick chimney is situated at one end of the building and is built, as a usual rule to hold four furnaces. The chimney simply serves as a hood to carry off the spelter smoke and has nothing to do with the furnace proper and no connection with it. As nearly all the zinc is burned out of the metal that is melted, it is necessary to have some method of carrying off the smoke. The brick chimney is of average height, say forty or fifty feet, and the smoke is drawn off easily.

Each corner of the brick chimney contains a recess, which may be seen in Fig. 1 and in which the furnace is placed. This furnace would seem a rather crude affair at first, but when one sees it in operation, it is soon appreciated and the fact understood that it answers the purpose admirably and is quite simple.

The furnace proper is illustrated in a sketch shown in Fig. 5. It consists of a sheet iron cylinder of approximately the dimensions shown, but the edges do not come together. There is left a space of some six or eight inches and the sheet iron is then set up against the brick wall of the chimney. In the bottom of the brick wall are the tuyers for supplying the air necessary for blowing the charcoal and producing the necessary heat. This tuyere is bricked in the wall, and by setting the sheet iron cylinder against the brick wall containing the tuyere, it is possible to avoid any complications in cooling it. The cooling of this tuyere is an important feature as a high heat is generated by the combustion of the charcoal, and it is accomplished by water-jacketing it. The tuyere is made of cast iron and the water is supplied by means of a tank shown in Fig. 6. The mills now use a modern fan for supplying the air and in Fig. 7 the small fan blower employed may be seen.

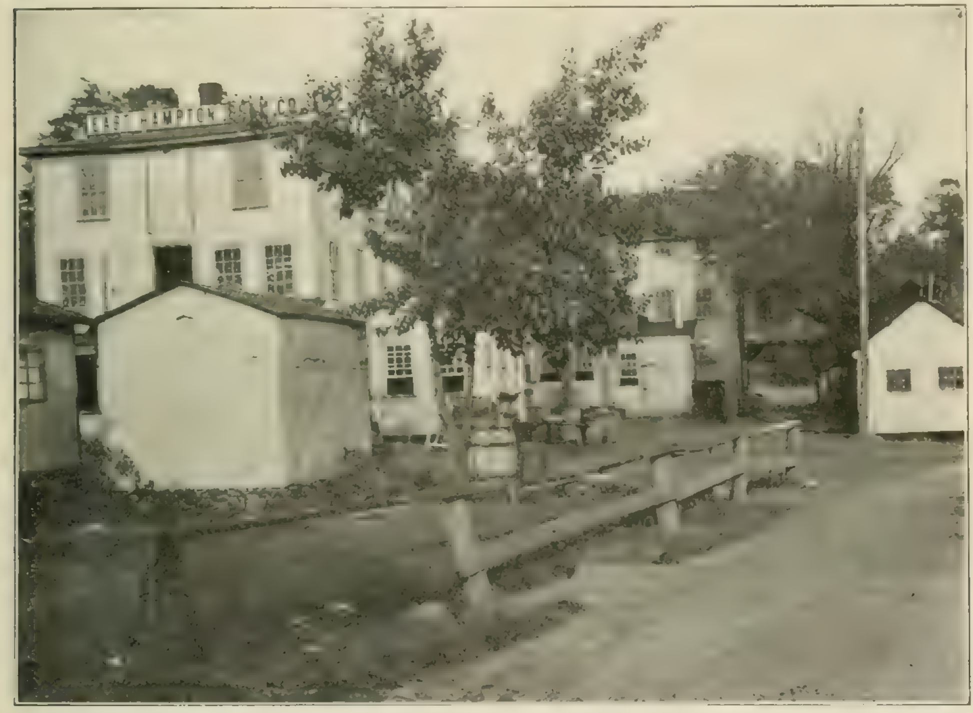

Fig. 4. The East Hampton Bell Co. of East Hampton, Conn., One of the Early Bell Foundries and Founded in 1836.

A nearer view of the charcoal furnace may be seen in Fig. 8. There are really two parts to it. First, the ladle upon which the sheet iron cylinder is placed, into which the melted metal falls, and from which the metal is poured. This ladle is shown in Fig. 9 and is made of wrought iron. A detachable wooden handle is used. This handle is placed on it just before pouring. The ladle is lined with fire clay and this lining lasts about two days. The clay used for lining the ladle is found in East Hampton and seems to be well suited for the purpose. It is claimed by the bell makers that no other clay has yet been found that will answer as well. Fire sand is mixed with it and the lining takes but a few minutes. The sheet iron cylinder is also lined with clay and a shoulder is fastened to it to hold the clay in place.

To begin melting with the furnace, the ladle is placed on the cinders on the bottom of the corner of the chimney. The sheet iron cylinder is then placed on the ladle and against the wall so that the tuyere is at the bottom. This is easily done. The cinders and ashes are next pushed around the joint between the ladle and the cylinder. A little wood fire is started in the ladle and when it is well under way, charcoal is shoveled into the cylinder until it is full. The blast, in the meanwhile, has been started.

The charcoal begins to burn, and within a few minutes a shovelful of metal is put on top of it. The peculiar part of the operation is that any kind of metal can be used and it matters not whether it is red or yellow, or whether it contains iron or not. In fact, iron is necessary for the successful manipulation of the furnace and if there is not sufficient present in the metal used, it is put in purposely. Red or yellow metal containing tin is to be preferred, as tin is necessary for the making of a good bell. If there is none in the metal used, then it is necessary to add a little for the reason that it cannot be produced except by adding it. Metals are removed during the melting, but they cannot be put in.

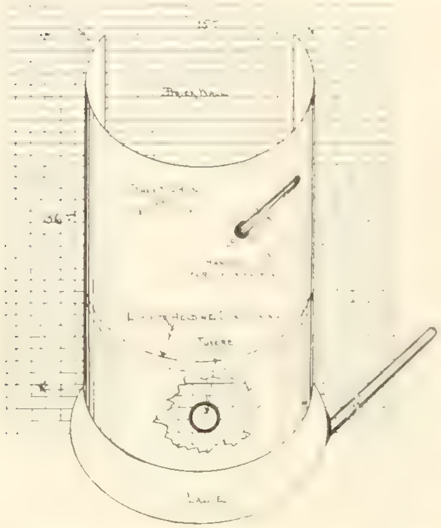

Fig. 5. Sketch Showing Shell of Charcoal Furnace and Manner of Setting Against Brick Wall Containing the Tuyere.

The metal put on top of the charcoal soon melts, and then smoke is given off, indicating that the spelter is being burned out. More charcoal is added from time to time and more metal, as the indications may require. The furnace operator (who is also the molder) knows by experience about how much charcoal and metal to add. No metal is ever weighed, but is simply added by means of a scoop shovel.

By and by, after the necessary amount of metal has been added and the spelter fumes are given off freely, a small piece of cast iron is added by throwing it on top of the charcoal. Stove plate is used and a piece a couple of inches square is taken. If, however, the metal used, contains considerable iron, then it is unnecessary to add it. Nails, screws and all other forms of iron, which would injure bronze or brass, when melted in the ordinary way, have no effect on the metal except to benefit it and they are never removed, but simply melted along with the brass or bronze material.

The object of the iron, the bell-makers say, is to act as a flux and purify the metal. Just what its action is is not clear, but the fact remains that the castings are clean and bright and do not contain any iron as shot, for many of them are turned in a lathe and no indication of iron can be discovered. This fact is remarkable. Although iron is introduced, it seems to oxidize and slag off and on top of the ladle will be found about an inch of dark colored slag, apparently rich in iron. Zinc, lead, iron, aluminum and other easily oxidizable metals are oxidized off during the melting. The copper and most of the tin seem to remain. This fact explains why it is possible to use any kind of metal, red or yellow and containing large quantities of iron, without af

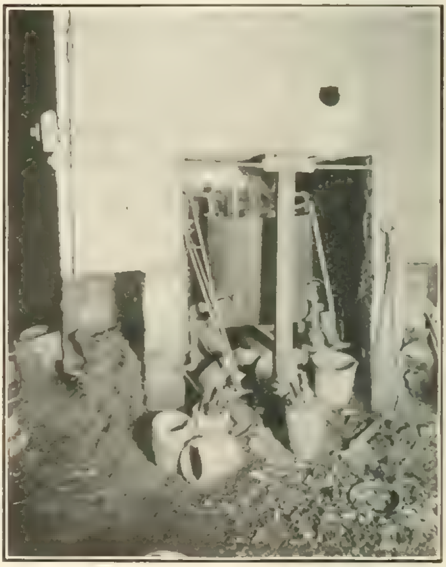

Fig. 6. Arrangement Used for Cooling the Tuyere of the Charcoal Furnace. The Crucibles Shown are Not Used in This Furnace but in Regular Crucible Furnaces.

fecting the character of the casting. The uniformity of the castings is phenomenal and they are of excellent quality.

When, according to the judgment of the furnace tender, the metal has been melted and is sufficiently hot, the sheet iron cylinder is taken off (this is done by the handle on the side) when the metal will be found in the ladle, covered with about an inch of slag. The slag is skimmed off and the metal is ready for pouring. It is usually necessary to add a little tin, in case there is none or an insufficient quantity in the metal melted, and this is done just before pouring. Pure tin is not used, as it is too expensive, but any soft metal with a tin base, such as old babbitt, pewter, etc., is used.

Fig. 7. The Fan Blower Used for Producing the Blast in the Charcoal Furnace. A Water-Wheel Supplies the Power.

The metal is now poured into the sand molds. As previously mentioned, the molder also attends to the furnace. In Fig. 10 the manner of pouring is shown. A large wooden handle is placed on the ladle and the molder places a strap around his neck and attaches it to the ladle handle by means of a snap. The strap is necessary for the reason that the ladle, with its metal, weighs about 100 lbs. and it is necessary, when one man performs the pouring, to have some support. The bells cast from the furnace are shown in Fig 11. A "heat" of six flasks is poured at one time and seven heats per day are readily obtained. Each melt in the charcoal furnace takes about an hour and the molder starts in at seven o'clock and is through by one o'clock.

The novelty of the charcoal furnace lies in the quality of metal produced. The charcoal and air, apparently, have a refining influence on the metal and the spelter, iron and other foreign metals that are easily oxidized, are burned out. Iron, as previously mentioned, is necessary for the success of the melting and if there is not sufficient quantity, then some is added, after the melting has begun, in the form of stove plate. It is remarkable how clean and bright the castings come. There is no black skin on them and the color is that of the best composition. If one were to see the castings without knowing in what kind of a furnace they were made, and from what kind of metal, he would believe that the best composition had been used. It makes no difference, however, whether the metal used is red or yellow, the result seems to be the same. Chips, grindings skimmings, old clocks, washings or any other material that can be purchased cheaply are used and the result seems to be perfectly uniform. The most remarkable fea-

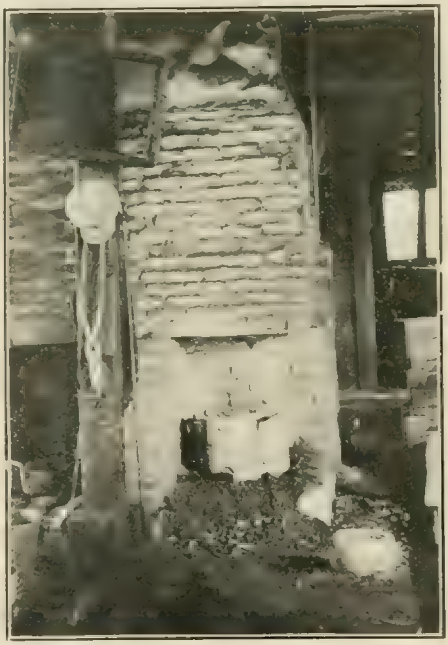

Fig. 8. Near View of the Charcoal Furnace, Showing Manner of Packing Ashes Around Joint Between the Ladle and Sheet Iron Shell.

ture is the fact that no iron seems to enter the metal that is melted. If it does, it is in the form of "combined iron" so that it cannot be detected when the bells are turned on a lathe. If it is combined iron, then it is so small that it has no appreciable effect on the castings. The surface is clean and bright and the metal is not particularly hard. It is, in fact no harder than a bell metal made from new copper and tin would be.

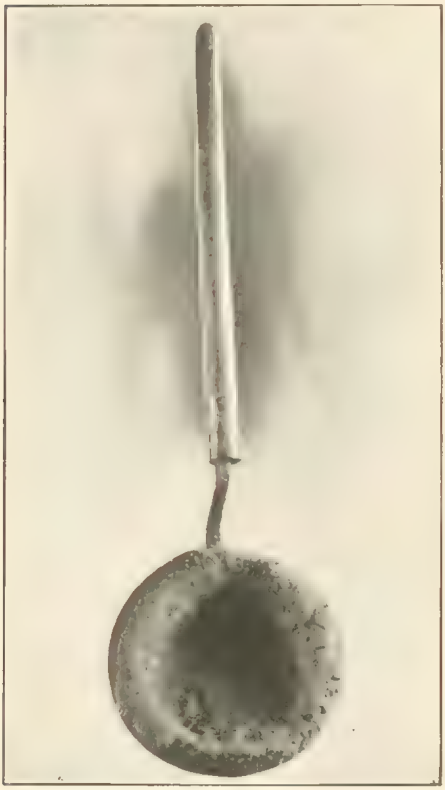

Fig. 9. The Ladle Used and Into Which the Metal Falls After it Has Melted. This is Lined With Clay Every Two Days.

Charcoal, of course, is comparatively cheap in East Hampton and at the present time costs about nine cents a bushel. It can be obtained at this price in other sections of the country and seems to be a remarkable fuel for melting brass and bronze. It contains no sulphur, which is the reason why such sound castings can be obtained and which are so clean. Coal or coke, containing the sulphur that they do, could not be used.

It will readily be appreciated that the East Hampton charcoal furnace is nothing but a type of cupola, made portable and with a ladle for pouring to avoid tapping off. It has been found particularly adapted to the work that is being done and has stood the test of years. When one sees the furnace in operation, the class of metal used and the quality of castings turned out, it is no wonder that the East Hampton bell makers have had no competitors in the class of work they have turned out. For years they have had the field to themselves.

All bells are not made in the charcoal furnace, but in East Hampton crucibles are used. There are many classes of work, where the finest toned bell is required, that demand new metals and for this work copper and tin are used. The charcoal furnace is used for quite a variety of work, however, and for cheap bells, such as sleigh bells and similar goods,

Fig. 10. Pouring a Heat of Sleigh-Bells, Shown in Fig. 11 from the Ladle of the Charcoal Furnace.

it cannot be equalled. Each heat takes, as previously mentioned, about one hour and about 60 lbs. of metal are obtained in the ladle for each pouring. Seven heats per day are obtained and this makes 420 lbs. of metal poured. It will readily be appreciated that it compares very favorably with the average brass foundry where metal is melted in cru-

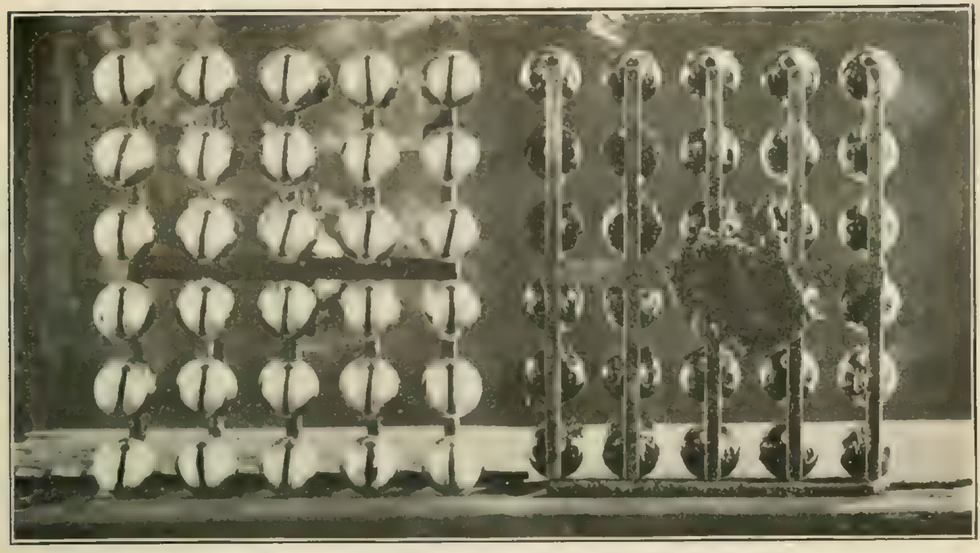

Fig. 11. Bottom and Top of Gates of Sleigh-Bells Cast from Metal Melted in the Charcoal Furnace. These Bells Were Red, Although the Metal Used Was Old Yellow Brass Clocks and Other Yellow Brass Material.

ibles; and in fact, it really surpasses the average work for the reason that the labor, on account of the molder attending to his own furnace, is reduced to the minimum. It is no wonder, therefore, that the East Hampton bell makers have been able to retain the manufacture of small bells in their own town for so many years.

## Difficulty in Tinning Spring Brass Wire.

A subscriber has experienced difficulty in tinning spring brass wire by dipping in hot tin, and which is of much interest for the reason that little has been known about this operation. No difficulty is experienced in tinning soft brass wire, but that encountered in tinning spring brass seems to be one of fire-cracking. Our subscriber makes the following remarks about his difficulty:

"Will you kindly give us information as to what process is used for tinning hard and spring brass wire? The wire would be from .015 to .022. Also whether .040, .050 and .060 or .100 could be tinned by the same method. We are well equipped for tinning soft brass wire, but find that spring brass wire cannot be tinned by this process of running through melted tin and using a flux before it enters the tin which is the regular method used by all manufacturers of wire."

"The trouble experienced is that the spring brass wire breaks and flies to pieces, after being run through the tinning machine, while the soft brass wire passes through without any difficulty whatever. The only method we have found for tinning the wire has been to tin it by dipping in a solution used for tinning small goods, (such as pins and eyelets). We would like to find some way of tinning the wire in the same manner we do the soft brass wire. This is run through acid and through a "wipe," then it is run through hot tin and then in water and coiled up on a reel. This is what we would like to do with the spring brass wire if possible."

The problem seems to be one of fire-cracking, and while, perhaps, known among some brass manufacturers, it is not generally understood. It apparently is impossible to tin the wire in the manner desired. High brass, of course, is subject to difficulties not experienced with bronzes, and it may be possible to use a spring bronze wire and tin it, as it does not fire-crack as easily as the brasses. This, however, is merely a suggestion.

The hot tin, through which the brass spring wire passes, seems to produce fire-cracking, and if this is the cause, which it it quite reasonable to assume is correct, there would appear to be no solution of the problem.

## Things Every Plater Should Know.

That a gold plating solution should be run hot whenever possible as the deposit has a better color, and covers more thoroughly and more rapidly.

That nickel solutions become alkaline by the introduction of potash or soda from the cleaning kettle and not from other causes. The tendency of a nickel solution is to become acid rather than alkaline unless an alkali is actually introduced

That a silver solution should be kept free from sediment or it will settle on the work and cause pits

That boracic acid is an excellent ingredient of nickel plating solutions as it produces a white deposit and prevents pitting.

That sal-ammoniac in a nickel solution increases the conductivity and causes the anodes to dissolve more freely.

That the amount of any metal deposited is dependent upon the number of amperes passing through the solution. Twice the number of amperes will give twice the weight of deposit in a given time.

That during the cleaning of any metal, there is always a slight oxidation of the surface which should be removed by a dip of cyanide or muriatic acid

That the formation of various colors on an article during brass plating is caused by too little free cyanide in the solution.

That blisters are a cause of spotting-out. They contain the plating solution underneath which gradually works out and causes spotting.

That the spotting-out of plated castings is caused by the plating solutions entering the pores and imperfections, and then coming out after the article has been finished.

That a soaking in clean, hot water for some time is the best remedy for spotting-out as it removes the plating solution in the pores and replaces it with water. This can be dried out.

That metals can be deposited over a greasy surface but they will not hold.

That copper is the best conductor of electricity and should be used instead of brass, whenever possible.

That tin should not be used in bronze solutions as the same results, as far as color is concerned, can be obtained with zinc and copper, and the solution is cheaper and easier to work.

That all connections for electrical conductors should be soldered as this prevents obstruction to the passage of the current like that which happens when unsoldered joints corrode.

That an excess of mercury will cause brass, bronze, copper and German-silver to season-crack and too much should not be used in preparing articles in the quick-dip for silver plating.

That the action of bi-sulphite of soda in plating solutions is to produce a [illegible], uniform deposit. It prevents the formation of basic salts.

That nickel solutions require a greater anode surface than employed for other metals, for the reason that the nickel does not come off readily for feeding the solution.

That the value of cyanide depends upon its cyanogen content and nothing else.

That sulphur is frequently present in cyanide and causes a patchy silver deposit.

That steel should never be allowed to dry after cleaning and ready for plating, but should be kept under water containing an alkali, such as sal soda, which prevents rusting.

That blisters come from the use of too much free cyanide or too strong a current in plating.

That too much acid in an acid copper solution causes a rough and brittle deposit

That scratches cannot be removed by electro-plating over them. The deposit follows the scratches.

That voltmeters and ammeters become inaccurate as they grow old. This is caused by the loss of magnetism in the permanent magnet in them and when this is the case, the instruments read too high.

That hot water used for rinsing should be clean and should not be used until foul. Plating solutions are supposed to be removed from the surface of articles by cold water and the hot water used for drying off the surface

"Plastic carbonates" is the name applied to the carbonates of copper, zinc or nickel and which have not been dried after precipitation. The water has been removed as much as possible by draining or by a filter press. These carbonates dissolve in cyanide solutions better and more rapidly than those which have been dried.

# The Rapid and Accurate Estimation of Silver in Silver Plating Solutions.

The following method is based upon the insolubility of silver sulphide in a dilute potassium cyanide solution and greatly simplifies the determination of silver in cyanide silver plating solutions. The ordinary method of determining silver, by decomposing the cyanide solution by hydrochloric acid and reducing the silver by zinc, and afterwards dissolving in nitric acid and titrating by ammonium sulphocyanate, is somewhat tedious; and in addition, the presence of a little copper in the plating solution (as always found in solutions that have been in use for some time) interferes with the process. There is often sufficient copper present to greatly interfere, so that with the tiresome decomposition and the interference of the copper, the process is rather annoying.

The method herein described is free from the preceding objections and does not involve the decomposition of the cyanide by acid. It is, therefore, free from that objection and poisonous fumes of hydrocyanic acid gas. In addition, it requires no filtering, unless one desires great accuracy and the whole process may be carried out without much labor. The only time consumed is in the settling of the silver sulphide and this requires no attention so that the operation is not tedious. It is believed that it is the simplest method known for determining the silver in a silver plating solution.

The operation of determining the silver in cyanide plating solutions requires the following apparatus. It is impossible to get along without them. They are absolutely necessary for the performance and are not costly. A few dollars will cover the entire expense and the apparatus may be purchased from dealers in chemical apparatus. The best should be purchased as they are the cheapest in the end:

1. A 50 c. c. glass burette, graduated in 1/10 c. c. This should be provided with a glass stopcock at the bottom. The burette is a regular piece of apparatus used by chemists.

2. A wooden burette stand for holding the glass burette.

3. A No. 4 glass beaker (Bohemian) with lip.

4. A glass stirring rod with a rounded end to go into the beaker.

5. Some ammonium sulphide.

6. Some C. P. ammonium sulphocyanate (ammonium thiocyanate).

7. Some C. P. nitric acid.

In ordering the glass ware, it is better to have a few beakers, rather than one as they may be broken and a reserve supply will then be had. The same is true of the stirring rods. These should be about the size of a very small lead pencil and rounded at the end to prevent scratching the glass. The ends are rounded by holding the glass in a Bunsen burner flame and melting it.

8. A small iron tripod.

9. A piece of asbestos board about 1/16 in. thick.

10. A Bunsen burner and piece of rubber tubing for connecting to gas supply.

*Beginning the Determination*

The burette is rinsed out with clean water and the stop-cock coated with a little grease to make it turn easy. Be sure to put on only a mere film or the hole in it will be stopped up. Then turn the burette upside down so that the water will drain out of it.

Now fill the burette with the silver plating solution above the zero mark and allow it to run out until the bottom of the meniscus (the curve of the top of the liquid) is exactly at the level of the zero mark.

Now allow the solution to run out in the glass beaker until 37.8 c. c. have been obtained. This amount is exactly one-hundredth of a gallon and the reason for taking this quantity is that no calculation is required at the end of the final estimation of the silver. The process is greatly simplified by it.

To the 37.8 c. c. (cubic centimeters) of the silver plating solution thus measured out, 250 c. c. (about ½ pint) of pure water are added. The water should be clean, although distilled water is not required. This will fill the beaker about half full.

Now add 30 c. c. of ammonium sulphide (about 1 oz.) to the beaker and stir the solution with the glass rod. The solution will begin to turn dark brown rapidly, indicating that the silver sulphide is separating out. Silver sulphide is not soluble in a dilute cyanide solution, and as the ammonium sulphide converts the silver into silver sulphide, it separates out.

Silver sulphide [illegible] seems to possess the property of coagulating, like the [illegible] not be heated as this does no good, but is allowed to stand in the cold. It separates out completely [illegible] The operation cannot be hastened and it is absolutely [illegible] seem to cause any error and may be disregarded in [illegible]

*[illegible]*

After the silver sulphide [illegible] settled, the clear liquid is poured off, taking care not to allow any of it to run out. This is not difficult for the reason that it is quite heavy and remains in the bottom of the beaker. If desired, it may be filtered, but this takes more time, and experiments have shown that very accurate results may be obtained by pouring off the clear solution instead of filtering it. The loss is very small, if one uses care.

When the solution has been poured off, water is added and the whole stirred up and allowed to settle. The settling this time takes place rapidly and a few minutes only are required. Now pour off the clear liquid again and fill up the beaker with water, stir and allow to settle again. Now pour off the water again until the silver sulphide has been left in the bottom of the beaker. Two washings of this kind, if the beaker is filled full of water and as much of it as possible is poured off, suffice to remove all of the foreign material to be washed away. The idea is to remove everything present except the silver sulphide.

## *Dissolving the Sulphide*

The silver sulphide is now dissolved in nitric acid in the following manner (if it has been filtered and washed, the silver sulphide, paper and all are put back into the beaker as the paper has no effect on the operation):

Add 30 c. c. (1 oz.) of water and 15 c. c. of strong, chemically pure nitric acid. Now place the piece of asbestos board on the tripod, place the Bunsen burner under it. Place the beaker on the asbestos board and heat it with [illegible]

[illegible] nitrate.

*[illegible] Solution*

It is now necessary to find the amount of silver in the solution. The operations previous to this were for removing the silver from the sample and converting it into nitrate. For determining the silver, ammonium sulphocyanate [illegible] it is frequently [illegible] rapid [illegible] A standard solution is made and which may be kept without deterioration.

Only chemically pure ammonium sulphocyanate should be used and to make the solution, dissolve 22 grams of it in 1 litre of water. This should be kept in a well corked or stoppered bottle. In case a plater has no means of weighing out the 22 grams of it in 1 litre, it can be obtained, already made up from dealers in fine chemicals. The ammonium sulphocyanate should be accurately weighed and the water accurately measured. It is essential that means for doing this should be had as the success of the operation depends upon it.

## *Determining the Silver*

The burette is now washed out, the water drained off from it and filled with the ammonium sulphocyanate solution. The liquid is then run down to the zero mark (so that the bottom of the curve or meniscus is at the level of the mark), when it is ready for running into the beaker.

The beaker containing the silver solution is placed under the burette and the solution allowed to run into it drop by drop with constant stirring with the glass rod.

When the drops strike the solution, it turns red on account of the iron in it, but on stirring this red color disappears and a white precipitate of sulphocyanate of silver forms. As more of the solution is run in, a flocculent precipitate instead of the turbidity is formed on account of greater quantity of the sulphocyanate of silver having been produced. The red color which is produced by the drop striking the liquid, disappears upon stirring. The addition of the ammonium sulphocyanate solution is carried on until the red color no longer disappears on stirring, and the whole solution is colored light pink. One or two drops, when the solution has nearly approached the end point will suffice to give the red color and no more should then be added.

The theory of the action of the ammonium sulphocyanate is that the silver is first precipitated and when all has been thrown down, the iron and ammonium sulphocyanate react giving the red color. The iron, therefore, is called the "indicator".

The amount of ammonium sulphocyanate is now read off on the burette and noted. *To obtain the amount of silver in the original plating solution, all that is necessary to do is to divide the number of cubic centimeters used in the burette by 10.*

For example, if the burette reading is 27.8, then 2.78 oz. Troy of silver are present in the sample of silver plating solution. The calculations have been made so that this simple division by ten gives the amount of silver in Troy oz. per gallon. This has been made possible by taking the 37.8 c. c. of the plating solution, which is a miniature gallon, so to speak, and the amount of ammonium sulphocyanate so that the silver can be obtained from the number of cubic centimeters used by dividing by 10.

The various steps in the process may be summed up as follows:

1. Running out exactly 37.8 c. c. of the silver plating solution to be tested into the glass beaker.
2. Adding 250 c. c. of water (about half a pint) to the beaker.
3. Adding the ammonium sulphide to the beaker and stirring. The silver is thus converted into sulphide.
4. Allowing to settle about half an hour.
5. Pouring off the clear liquid on top of the silver sulphide in the beaker.
6. Washing with water by stirring up, allowing the silver sulphide to settle and pouring off the clear solution at the top. This is repeated several times until the silver sulphide has been washed free from impurities.
7. Dissolving the silver sulphide in nitric acid.
8. Adding a small piece of iron wire to the solution while the silver sulphide is being dissolved in the nitric acid.
9. Adding enough water, after the silver sulphide and iron have been dissolved to fill the beaker about half full.
10. Adding the "standard" ammonium sulphocyanate solution to the silver solution in the beaker until the red color which forms does not disappear on stirring.
11. Dividing the number of cubic centimeters of the ammonium sulphocyanate used by 10 and obtaining the number of Troy ounces of silver per gallon in the silver plating solution.

This process has been proven accurate by the following experiments made to determine its value.

### *Proving the Method*

A solution containing 3 oz. of silver and 3 oz. of free cyanide to the gallon was made up in a very careful manner. This was used as a test solution. The following tests were made on it by the method herein described:

| *Amount of silver in Solution* | *Silver Found* | *Remarks* |
|---|---|---|
| 3 oz. .......... | 2.98 oz...... | Poured Off |
| 3 oz. .......... | 2.96 oz...... | Poured Off |
| 3 oz. .......... | 2.93 oz...... | Poured Off |
| 3 oz. .......... | 2.99 oz...... | Filtered |

It will be noticed from the result of the preceding experiments that the process, even when the liquid is poured off from the silver sulphide and not filtered, is capable of giving quite accurate results. There is undoubtedly a slight solubility of the silver sulphide in the cyanide solution, but is so slight as to be of no consequence in regular work.

The fact that there are no fumes given off and no filtration necessary, greatly simplifies the process of determining silver in a silver plating solution and it would seem that the average plater with a little practice could master the details of the work. The results obtained are quite accurate and can be obtained within a short time.

## A New and Novel Method of Making Brass Articles (Molded Brass Parts).

Attempts have been made to cast brass in metal molds, the same as the castings of the soft, white metal, but it has not been successful up to the present time. The shrinking of the metal during the cooling has been the obstacle. The Doehler Die Casting Co. of Brooklyn, N. Y., however, the well known makers of die castings, have "taken the bull by the horns" and have succeeded in producing parts of brass which can be used, in many instances, to replace machined sand castings of this metal. These castings are made of brass, but are pressed out while in a plastic condition in an accurately machined mold. The brass used is of such composition that it is soft while hot, but strong and hard while cool. The castings, therefore, require no machining and may be used to replace the expensive machined sand castings, but without the difficulties in the way of pin-holes and other imperfections.

The company are supplying the following information in regard to this new and novel product. It is believed that it will have a large field as it is new and novel and, as far as known, has never been placed on the market before. They say:

"As the name indicates, these 'Brass Parts' are produced in molds which give them a smooth finish and comparatively close accuracy.

The brass, heated to a semi-fluid or plastic state, is subjected in the mold to a very high pressure, thereby filling out the mold and producing a part which is the exact opposite facsimile of the mold.

The parts manufactured by them are accurate reproductions of the pieces as they are delivered by the mold. They are ready for assembling and require no further machining except where close dimensions are necessary.

We can hold dimensions, generally speaking, within .002" to .005" depending on the general construction of the part. Where closer dimensions are required the part must be machined. We prefer to take up the question of accuracy with reference to the particular requirements in each case.

By reason of the enormous pressure to which the parts are subjected they become absolutely homogeneous and free from all possible casting defects, consequently having greater strength and tenacity than brass castings.

[illegible] of copper [illegible] and [illegible]. It has a tensile strength of approximately 45,000 pounds per square inch, an elastic limit of [illegible] pounds, the ultimate tensile strength, and an elongation [illegible] of about 20%. We cannot work to special formula as our process requires a metal of certain qualities to get the best results.

For each part we construct a series of molds which are not costly in comparison to the savings they make possible in the cost of production of the part. The cost of constructing the molds is charged to the customer, but the molds remain in our possession and are kept by us in good working condition for future use. They will, of course, not be used for anyone else.

For the present we are confining ourselves to small parts weighing a pound or less and not exceeding three inches in over-all dimensions. We do not form holes, slots or threads, but the parts are delivered as a solid piece with holes spotted only, excepting such parts which can be perforated by a punching operation.

Our molded brass parts are so far superior to the rough, defective and unreliable ordinary brass castings in finish, homogeneity and strength, that they would be desirable."

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Rosin is the best flux for tin and lead alloys and is quite efficacious and cheap.

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Manganese-bronze chips can usually be distinguished from composition by their shape, although they have nearly the same color. They are not as fine and short as composition and frequently are quite large.

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In order to obtain a high tensile strength on manganeze-bronze castings, it is necessary to use a refined spelter in it. Ordinary spelter contains some lead which reduces the tensile strength and elongation of the manganese-bronze castings.

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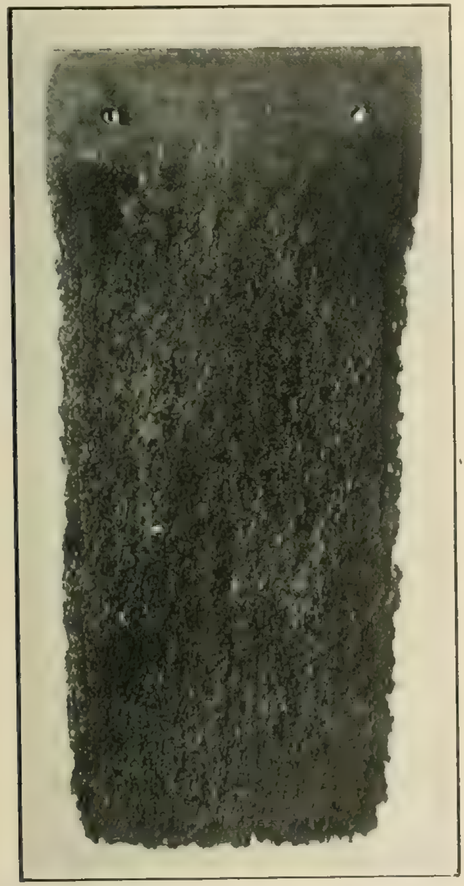
Manganese has more affinity for sulphur than any other metal and can be used to a good advantage in copper alloys for removing it. It unites with the sulphur, forming manganese-sulphide which rises to the top of the metal as slag.

## Rolled Nickel Anodes.

Although rolled anodes in metals other than nickel are daily used and give good results, rolled nickel anodes have never met with much success in the plating field. They have been tried in all countries and are being used more or less extensively abroad, but they have been found wanting. Platers have been attracted by them on account of their purity, but, strange to say, a pure nickel anode does not work as well as an alloyed one.



**Sheet Nickel Anode That Had Been in Use for Several Months. The Irregular Action of the Nickel Solution May be Seen.**

Nickel must be quite pure or it will not roll. Hence a rolled nickel anode is sure to be pure. When one uses a pure nickel anode for plating, either rolled or cast, it will readily be found that they do not dissolve evenly.

Nickel has the property of becoming "passive". That is, hydrogen gas bubbles attach themselves to the surface of the anode, impeding the passage of the current and preventing the action of the sulphuric acid set free at the surface from acting upon the nickel. In an alloyed anode this does not take place, or if it does, to only a very slight extent, and hence the nickel is readily attacked by the sulphuric acid and dissolved. The iron, carbon and tin, which are always present in a good nickel anode (cast) in addition to the nickel itself, cause a local electrolytic action to be set up on the surface of the anode and liberate the hydrogen bubbles. This is the reason why cast nickel anodes are preferable.

In the illustration, herewith shown, a rolled nickel anode after it has been used for some time may be seen. This anode was of pure nickel of a purity of about 98%, which is about as pure as commercial nickel can be obtained. The sheet nickel was about one-eighth of an inch in thickness and was in use about five months. The plater who used it pronounced it "hard". The surface, it will be noticed, did not dissolve evenly, but streaky or in spots.

Rolled nickel anodes, it is believed, are not as satisfactory as those which have been alloyed with the right amount of iron, tin and carbon. They can, however, be used, but platers have always pronounced them "hard" in that they do not dissolve readily. Therefore, they do not supply nickel to the bath as rapidly as it is removed during its deposition on the work. The solution, according, must be replenished by nickel salts which is the most expensive way to buy nickel and in addition, the amount of nickel needed cannot be ascertained so that it is added indiscriminately in the form of single nickel salts. The best method is to obtain the nickel from the anodes and for this purpose an alloyed anode has always been found to give the best satisfaction.

When a brass deposit has several different colors, it indicates that more cyanide is needed in the solution.

Glass beads are useful in stringing some kinds of plated work for plating such as pens, washers and other flat articles which nest together. The beads are placed between each article

# Testing Gold Plated Articles of Brass.

It is frequently [illegible] to [illegible] whether a small article of brass has been gold plated or is [illegible] [illegible] [illegible] brass plating. It [illegible] [illegible] [illegible] [illegible]. Scarf pins, [illegible] [illegible], and many other small brass goods are either gold plated and must be [illegible] [illegible] [illegible] [illegible] natural [illegible] the brass. In the last case, the brass [illegible] [illegible]al mixture resembling gold. There are [illegible] [illegible] [illegible] such as [illegible] [illegible] [illegible] these [illegible] [illegible] [illegible] gold. It is [illegible] required, therefore, to know whether a certain article has been gold plated.

The method of testing is not difficult, when the amount of gold on the goods is not to be determined, but all that is required is to know whether the article has been actually gold plated or not. The following method will be found satisfactory.

Place the articles to be tested in a dish that is perfectly clean and cover them with amyl acetate. Allow to stand for several hours until any lacquer that is on the goods will have been removed. Then pour off the amyl-acetate and rinse them several times with fresh amyl acetate to make sure there is no lacquer left on them. If the testing is carried out without first removing the lacquer the results are not satisfactory. The acid, used for dissolving the articles will not dissolve the lacquer, but will leave it in suspension, floating around in the liquid and masking the reaction for gold. The only satisfactory method is to first to remove the lacquer. It can, of course, be removed by potash or soda, but this method does not seem to give as good results as its removal by amyl acetate. The potash or soda is apt to attack the metal slightly, in the portions not covered by the gold and cause it to flake off. The amyl-acetate, however, will not do this and the gold is left intact on the surface.

The next step is to dissolve the article in dilute nitric acid. For this purpose a large glass test-tube is necessary. A small one is not satisfactory and one about three-quarters of an inch in diameter is large enough to prevent the liquid from boiling over when heated. Place the article or articles in the test tube, which must be very clean, and cover with dilute nitric acid. This dilute acid is composed of 1 part of nitric acid and 4 parts of water. Chemically pure nitric acid must be used. The commercial acid will not answer, as it contains a little [illegible] which will cause the gold to dissolve.

One might naturally believe that, inasmuch as the brass article had been gold plated, the nitric acid will not attack it, but this is not the case with the ordinary light deposit of gold on cheaper dip-gilded goods, or those which have received a light deposit in the regular manner. If, however, a heavy gold deposit has been put on, the acid frequently may refuse to "bite" and this will indicate that there is gold on the surface of the article. The ordinary article of a small nature, however, does not have enough gold on it so that the acid will not take hold.

When the acid has been put on the article or articles in the test tube, the tube is slightly warmed and it will be found that the acid will begin to attack the surface. This is allowed to go on, with occasional warming, if necessary to hasten the action, until the articles have been completely dissolved. Now boil the acid in the tube for a short time over a Bunsen-burner. This boiling is actually necessary as the gold, that has remained undissolved during the treatment with the acid, will then coagulate. It will now be found that the gold will either settle to the bottom of the test-tube, if there is a fairly heavy deposit of gold, or float on the surface, in case the articles have been dip gilded or have a very light gold deposit on them.

The theory of the process, of course, is that the nitric acid dissolves the brass and leaves the gold. The gold is usually brown, but by boiling attains a metallic lustre and is easily recognized. In the case of dip-gilded goods, there is usually such a small amount of gold on them that it usually floats on the surface of the acid in the test-tube. It is easily recognized, however, as it will have a metallic lustre after the acid has been boiled, although it will be brown and very finely divided before this has been done. The boiling will not only coagulate it, but will produce the metallic lustre so that one can readily ascertain that it is gold. The gold, when it floats on the surface in this manner, is known as "float-gold" and after boiling one can easily recognize that it is gold.

In the case of articles that have been more heavily gilded, the gold will settle to the bottom of the test-tube; but on boiling will coagulate and attain a metallic lustre. It will be more than even the "flat gold" previously mentioned as there is a large amount of it. When there is a large quantity of gold on the article produced by heavy gold plating, the acid may frequently refuse to act at once, but if the articles are cut in two so that a surface of the brass is exposed, there will be enough of it exposed to allow attacking by the acid. The solution will then take place under the gold and it will be peeled off in fine scales. This will have a metallic lustre, of course, on boiling and is very readily recognized, even more so than the other forms of gold previously described.

## Depositing Copper on Plaster of Paris Articles.

A new method for depositing copper on plaster of Paris articles has been described by A. Dufay in the *Chemical News*, 1912, 106, page 225. The method is as follows:

The plaster article is thoroughly dried and then warmed, after which it is introduced into a bath of melted paraffine, heated to about 150° F. The article is then removed and allowed to cool. The paraffine permeates the plaster and renders it waterproof.

The article is now coated with a thin layer of collodion, made dilute with ether and alcohol and then allowed to dry. The surface is now coated with electrotypers' plumbago, the copper wires for conducting the electricity are attached and then a second coating of plumbago is given it.

The plaster article is now placed in a 10% solution of aluminum sulphate for a few minutes and is then placed in the copper plating bath made of sulphate of copper and sulphuric acid. This solution should contain, the writer says, from 5 to 8 per-cent of sulphuric acid. A current density of 1 ampere per square decimeter is used at 3 volts.

The writer states that the aluminum sulphate is of assistance in producing a rapid copper deposit all over the surface.

Graphite galvanizing kettles have proved to be satisfactory for galvanizing as the zinc does not attack them and there is then a very much less accumulation of zinc dross.

## Graphite Retorts for Melting Aluminum.

Iron kettles are now being extensively used for melting aluminum but are open to the objection that they introduce iron into the metal. This is particularly true if the heat is not carefully regulated. Aluminum alloys readily with iron and the hotter the iron is the more readily the alloying takes place. The introduction of iron into aluminum causes it to have a coarse, crystalline structure and lowers its strength and elongation. It does not take much iron to injure aluminum and the iron kettle, therefore, is not as satisfactory as a graphite crucible.

A Graphite Retort. This is Made of Regular Crucible Material.

The reason that iron is used for melting aluminum is that the kettle can be heated in the same manner as for melting solder or babbitt. That is, the products of combustion and flame do not come in contact with the metal while it is melted or while the melting is taking place. When aluminum is melted in crucibles the products of combustion injure it and this is the reason why iron kettles have been so attractive. If the aluminum is prevented from alloying with the iron, (which by the way, requires much care in preventing it) the castings produced are excellent and have good physical characteristics; but if not, then the aluminum is injured.

The graphite retort would seem to be an excellent thing for melting aluminum, and as far as known has not been tried for this purpose. Its shape is such that the aluminum would not come in contact with the products of combustion and nothing would be taken up from it.

The retort is set in a furnace with the end or mouth protruding and is not removed at all. The furnace, in which it sets can be either stationary or tilting. If stationary, the aluminum can be ladled out, the same as it is from the iron kettles, or if the furnace is of the tilting type, it can be poured out.

Silver has been successfully melted in retorts and a fine quality produced. The objection found to its use, however, was one of mechanical injury when the large bars of silver were charged. In the case of aluminum no such injury would take place on account of its lightness.

Graphite retorts are used in the silver smelting industry for distilling zinc from silver residues and are extensively employed for this purpose. Their use is now well understood and there is no difficulty in the way for their employment in the aluminum industry. It is believed that their use for melting aluminum is well worth investigation by aluminum founders as it would obviate all difficulty in the way of aluminum absorption.

## Nickel Eczema or Itch.

It is not generally known that nickel solutions, when they come in contact with the skin, will often produce a skin disease analagous to that produced by cyanide. In fact, in the United States, it does not appear to have been at all recognized. The factory inspector of the Kingdom of Saxony, Germany, Herr Mueller of Leipzig, made an investigation of this affliction and its cause and an extract from his report is of interest: R. F. Lang, 31 Broadway, New York City, is the American representative for the soap mentioned, and also is agent for the United States Electro Chemical Works of Germany. Herr Mueller makes the following statement:

"In my capacity of Factory Inspector, it devolves upon me as part of my duty, to enforce the laws as to sanitation of the factories themselves as well as to combat and diminish the dangers to the workingmen therein employed, resulting from their handling of poisonous substances and to safeguard them as much as possible against dangerous and health destroying influences so far as this can be done.

Many laws have been enacted for the prevention of diseases among workmen which are rigidly enforced in my district. I refer to the laws regulating the manufacture of substances in which lead, zinc, sulphur, chrome, phosphorus, chemical salts etc., and their varied combinations enter, and my recommendations to the authorities have resulted in many instances in the enactment of new laws and regulations all aiming in the same direction.

In inspecting establishments where nickel plating is done, I have found many of the workmen employed suffering from a skin disease resulting from their coming in contact with the nickel solutions. This disease is commonly known among the workmen as "nickel-itch" on account of the continual itching it causes. It may better be termed "nickel-eczema" as it appears a good deal like that disease only that it will disappear in a comparatively short time if the workman keeps away from the plating tank.

No law has yet been enacted for the prevention of this disease, but now an effective remedy and prevention have been found, I have no doubt that before long all nickel platnig establishments will be compelled to use the same. The remedy is a dual one, a soap and a salve and called "Verelfa" galvanizers' soap and salve.

Immediately after I learned of the discovery, I interested some of the largest plating concerns and induced them to make experiments which brought surprising results. I know of several cases where men who had been suffering for years, had been completely cured within a short time. The disease has not reappeared as they are continuing to use the soap and salve from time to time. The remedy is applied by washing the hands and infected parts with the soap, after ceasing work and then applying the salve.

# Alloys of Cobalt with Chromium and Other Metals.*

**By Elwood Haynes.**

As in organic nature, certain animal and vegetable forms have undergone modifications, and thus, as it were, fitted themselves to live in a new environment, so it has been found possible in certain instances to form new metallic combinations which are practically immune to the natural condtions that exist on the earth at the present time. A few of the rare metals, such as gold, silver, and the metals of the platinum group, are found native, but the commoner heavy metals are nearly always found in the form of oxides or sulphides.

For a number of years I have made experiments with a view to finding certain metallic combinations or alloys which would not only resist oxidation and other harmful influences, but would also possess valuable physical properties, which would render them fit for special services. The first decisive step made in this direction, was the discovery of an alloy of nickel and chromium in 1898. The properties of this alloy have already been described in a previous paper. Immediately following the discovery of the nickel-chromium alloy, I produced an alloy of cobalt and chromium. This has likewise been described in the previous paper, but the range of proportion between the cobalt and chromium is so great, and the combination is modified to such a marked degree by the introduction of other substances, that I have felt justified in reading another paper on this subject, describing more fully my researches in this particular direction.

As early as 1907 and 1908, I made alloys or combinations of cobalt, chromium, and tungsten; cobalt, chromium, and molybdenum; and cobalt, chromium, tungsten, and molybdenum. I have made alloys of cobalt and chromium containing zirconium, tantalum, throium, titanium, vanadium, etc. I have also added to the cobalt-chromium alloys, the non-metallic elements, carbon, silicon, and boron. Some exceedingly interesting results have been obtained from these various combinations, and while further investigation is necessary in order to fully determine their chemical and physical properties, a number of them have shown interesting economic possibilities.

The preliminary fusions were made in graphite crucibles by means of a furnace operated by natural gas. I was later obliged to use crucibles of a special composition, not only to avoid the contamination of the metal by carbon from the crucible, but also because they proved more reliable under long-continued heating, than those made of graphite.

The metal tungsten alloys readily with chromium and cobalt in all proportions. When added in small quantity to the cobalt-chromium alloy, it seems to have little influence on the properties of the combination, but if the proportion rises to 2% or 3%, a notable effect is produced. Generally speaking, the cobalt-chromium alloy becomes harder and more elastic, especially if it contains a small amount of carbon, boron, or silicon.

The following experiment shows the effect of melting the alloy in a graphite crucible: 90 grams of cobalt, 6.3 grams of tungsten, 18 grams of chromium, together with a small quantity of calcium silicide, were introduced into a graphite crucible. The resulting alloy was very hard, and the crucible much eroded on the inside. The bar could be slightly flattened at one end, and after being made into a cold-chisel, showed remarkable qualities. It would not only scratch glass, but also quartz crystal. It was quite tough at ordinary temperatures, and would cut small chips or shavings from a piece of "Stellite." At a bright yellow heat it showed signs of fusion, and became covered with a skin of oxide.

An alloy was made by melting the following in a special crucible: cobalt metal 80 grams, tungsten 7 grams, calcium silicide 10 grams, calcium carbide 5 grams. As soon as the above were melted, the crucible cover was removed, and 15 grams of an alloy of cobalt and boron were introduced. The crucible lid was then replaced and the heating continued. A heavy, thick slag formed, which was removed before pouring the metal. The resulting bar was very hard and *elastic*, but only drew slightly under the hammer, and then broke. A cold-chisel made from the cast metal cut iron readily. The bar was broken up and remelted with about one-third of its weight of an alloy of cobalt, chromium, tungsten, and carbon. The result was a fine-grained alloy which was very tough, and would draw out to a considerable degree under the hammer without checking. It's elastic limit must have been very high, since when it broke, the pieces were thrown violently.

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*From the Transactions of the Eighth International Congress of Applied Chemistry, Vol. 11, page 110

Taking the alloy of chromium and cobalt as a basis, and holding the proportion of chromium at 15% of the entire mixture, it was found that the alloy gradually increased in hardness with the percentage of tungsten. When the quantity of tungsten rises to 5%, the alloy becomes distinctly harder, particularly when forged under the hammer. When the tungsten reaches 10%, the metal still forges readily, and a tool formed from the alloy takes a fine cutting edge. This alloy is suitable for both cold chisel and wood working tools. When the tungsten rises to 15%, the metal can still be forged, but great care is necessary in order to avoid checking. This alloy is considerably harder that that containing 10% of tungsten, and is excellent for cold chisels. When the tungsten rises to 20%, the alloy is still harder, and can be forged to a small extent. It makes good lathe tools for cutting steel and other metals at moderate speeds. When the tungsten rises to 25%, a very hard alloy results, which cannot be forged to any extent, but casts readily into bars which may be ground to a suitable form for lathe tools. These tools have shown great capabilities, particularly for the turning of steel, since they are very strong, and retain their hardness at speeds which almost instantly destroy the cutting edge of a steel tool. The tungsten may be still further increased to 40%, and the alloy will retain its cutting qualities, and for turning cast iron, this alloy answers even better than that containing 25%. When the tungsten reaches 40% or more, the alloy becomes so hard that it will not only scratch glass, but will readily scratch quartz crystal. A small drill made of this material, drilled a hole through the wall of a glass bottle without the addition of any liquid or other lubricant. A 3/8" square cast bar, when ground to a suitable edge, was set in a tool-holder attached to a lathe. The workman who had operated the lathe, had been able to turn to form 26 cast iron wheels in 10 hours with a steel tool of the same size. The "Stellite" tool turned 49 of these wheels to form in the same time. The steel tool was ground 50 times during the operation, while the edge of the "Stellite" tool was dressed slightly by a carborundum whetstone, after its day's work was completed. A set of steel cutters, placed in the boring head of a cylinder boring machine, were able to bore from 20 to 28 holes in 10 hours. These cutters were replaced by others made of "Stellite" which performed the work in 3 hours and 20 minutes, or a little more than 1/3 the time. Not only was the speed of the mill doubled, but the feed also, and notwithstanding this severe ordeal, the "Stellite" cutters were only slightly worn, while it would have been necessary to re-grind the steel cutters at least two or three times for the same service at slower speed. Some remarkable results were obtained in the turning of steel on the lathe. For example, a cylindrical bar of annealed nickel chrome steel, about 2½" in diameter, was placed in a lathe and turned with a steel tool at about as high a speed as the steel would permit without "burning." The steel tool was then replaced by one of "Stellite" and the speed at the same time increased to 2 1/3 its former speed. The "Stellite" tool retained its edge under these severe conditions, and produced a shaving weighing [illegible] pounds a minute. Just what the effect of this alloy will be on machine shop practice, is at present, somewhat difficult to determine. In my opinion, however, it will not fully supersede high speed steel in the machine shop, but in cases where rapid work is the main consideration, it will doubtless replace high speed steel.

When molybdenum is added to a 15% chromium-cobalt alloy, the alloy rapidly hardens as the molybdenum content increases, until the content of the latter metal reaches 40%, when the alloy becomes exceedingly hard and brittle. It cuts keenly and deeply into glass, and scratches quartz crystal with ease. It takes a magnificent polish, which it retains under all conditions, and on account of its extreme hardness, its surface is not readily scratched. When 25% molybdenum is added to a 15% chromium alloy, a fine-grained metal results, which scratches glass rather readily, and takes a strong, keen edge. Its color and lustre are magnificent, and it will doubtless find a wide application for fine, hard cutlery. It cannot be forged, but casts readily, and its melting point is not abnormally high.

If carbon, boron, or silicon be added to any of the above alloys, they are rendered much harder, though their effect is not always desirable, since they tend to render the alloys more brittle.

If either tungsten or molybdenum is added to a cobalt-chromium alloy containing 25% of the latter metal, the hardness of the alloy is rapidly increased. When the percentage of tungsten, for example, reaches 5%, the alloy can be readily forged, and forms an excellent combination for wood-cutting tools, such as chisels, pocket knives, etc. When molybdenum is added to the same mixture of chromium and cobalt, much the same effect is produced, though, generally speaking, a smaller quantity of molybdenum is required to produce a given increase in hardness. In some instances I have found it advisable to add both molybdenum and tungsten to the cobalt-chrominum alloys. Generally, the color and luster of these alloys, after polishing, are magnificent, and they seem to resist atmospheric influences equally as well as the binary alloy of cobalt and chromium.

## Correspondence.

### Use of Boracic Acid in Brazing.

*Editor*:

I note in the November issue of *The Brass World*, Question No. 1227 which is as follows: "What is the best formula for removing borax from a joint after soldering? We use silver solder and borax for the soldering flux."

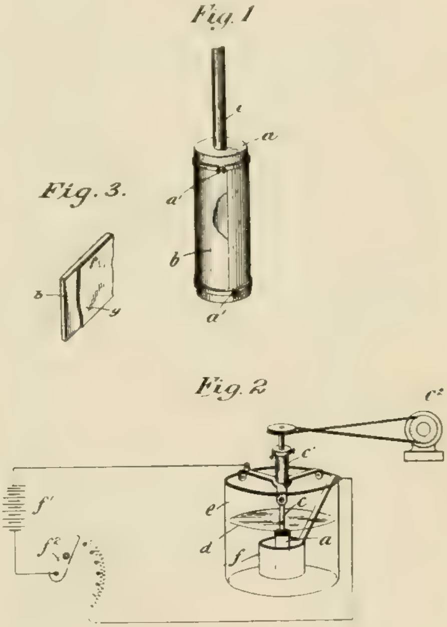
In reply to the preceding question, I beg to say that several years ago, when the bicycle business was prosperous, the makers had difficulty in removing borax glass which formed during the process of brazing. Attention was then called to the fact that boracic acid (boric acid) would be a better flux for them to use as it would not form a hard, fused glass, soluble in water with difficulty. After submitting a few samples, they said the boracic acid was preferred. Possibly the subscriber who asked the preceding question might find his trouble greatly lessened if he uses boracic acid instead of borax as the brazing flux.

*H. I. Harris.*

*Pacific Coast Borax Co.*
*New York City, Dec. 18th, 1912.*

## Making Compound Platinum Contact Points by Electro-deposition.

Large quantities of platinum are annually consumed in making contact points for electrical apparatus, and the present high price of this metal has caused much attention to be given to methods for economizing in it. The following method has been patented by Frank R. McBerty of New Rochelle, N. Y., and the patent is owned by the Western Electric Co. of Chicago. The process is novel in that instead of plating platinum on a metal, the metal is plated on the platinum and copper is used for this purpose on account of the facility with which it may be deposited. The process is described in the following manner:



Sketch Showing Method of Making the Compound Platinum Metal.

"The present invention provides a method for producing plates or material from which may be made contact pieces of moderate cost capable of fulfilling all the conditions described. Each of these contact pieces is composed of a surface film of platinum foil, backed by a heavy plate of pure copper electrolytically deposited upon the platinum. The platinum foil may be one thousandth of an inch thick, while the copper backing may be one [illegible] This material is produced in sheets, and from these, stampings are made in the form of cup shaped disks which are placed in recesses [illegible] the switch levers or elements, and crushed or flattened into the recesses to be securely held with the platinum face exposed in proper form. As this process of mounting the contact produces a considerable distortion of the base metal and also of the same with relation to the platinum face, special means and processes must be employed for insuring adhesion between the platinum face and the backing and suitable malleability in the backing metal.

The invention is illustrated in the accompanying drawing.

In this drawing Figure 1 represents a mandrel for holding the platinum foil during the process of plating. Fig. 2 represents the appliances for rotating the mandrel bearing the platinum foil and for supplying to it at the same time a graduated current to produce the deposit. Fig. 3 represents the sheet of material.

As shown in Figs. 1 and 2, a cylindrical mandrel *a* is mounted vertically in an electrical plating bath, being made one pole of the plating circuit. This mandrel *a* is provided with clamps *a'* by which a sheet of platinum foil *b*, shown partly in section, may be folded about and secured to its cylindrical surface. The bottom of the mandrel may be covered with wax or insulating material. The mandrel is mounted upon the end of a shaft *c*, carried in a journal *c'*, and driven from a suitable motor *e*. The mandrel depends in the electrolyte *d* in the plating tank *s*, which contains also the tubular anode *f*, for its other pole. The cathode mandrel *a* with its covering *b* and the plate *f*, constitute the terminals of a circuit including a generator or battery *f'* and a regulating switch *f''*.

For the purpose of producing a proper plating upon the foil *b*, the usual copper plating bath may be employed. The mandrel may have an approximate peripheral speed of 50 to 100 feet per minute. In producing the deposit the platinum foil is first washed with water, then with strong potash, with dilute nitric acid, and finally with distilled water, to produce a chemically clear surface. The mandrel is then inserted into the bath and set in rotation, after which the depositing current is applied, being raised gradually from an extremely low value to such a value per square inch as begins to [illegible] deposit. The current is usually [illegible] in this manner [illegible] short time, say [illegible] minutes, until a fine, hard, continuous and coherent deposit appears upon the platinum plate, after which it may be raised rather rapidly.

The result of applying the current for a considerable time at a very low value is to produce an initial coating of copper which adheres very strongly to the cleaned surface of the platinum; thereby the composite contact is enabled to withstand the deformation during the mounting process without impairment of adhesion between the face and backing. The rotary process of plating produces an extremely fine grained, tough and malleable coating of pure copper. After a plating about one fiftieth of an inch thick has been produced, which may be in one or two hours, the mandrel is removed and the platinum foil *b*, backed with a layer of copper, is stripped off."

## The Nickel Supply for Coinage.

For the second year in succession, the United States Government has placed the order for the annual supply of pure nickel with the United States Nickel Company of New Brunswick, N. J.

The metal supplied by this company is the well known "cube-nickel", refined from New Caledonian ore, which is a high grade nickel magnesium silicate, remarkably low in cobalt and almost entirely free from copper, arsenic, sulphur and phosphorus. On account of its uniform purity (always analyzing above 99%) it is widely used in European metal works, and up to about ten years ago enjoyed great favor among American manufacturers of nickel products.

Since re-entering the American market, the company has been having remarkable success in introducing its product to the trade, and the ready endorsement given the metal by the United States Mint, where purity and uniformity are so necessary, is considered a compliment of the highest order and insures a permanent place in the American market and a standard metal for all the varied industries where pure nickel is employed.

## Things That Every Brass Founder Should Know.

That blowholes and pinholes in castings are produced by the same thing. Blowholes are only large pinholes.

That blowholes in castings are nearly always caused by overheating the metal during melting.

That metal that has been overheated and then cooled down to the right pouring temperature is not as good as that which has been heated only to the right degree and requires no cooling down.

That aluminum and aluminum alloys require pouring at a low temperature in order to obtain sound and strong castings.

That composition and brass require pouring at a much higher heat than aluminum and its alloys in order to obtain good castings.

That tin hardens the brasses and bronzes. The more they contain the harder they become.

That lead causes the brasses and bronzes to cut freely, but an excess weakens the castings and is apt to separate out in spots.

That iron, when chemically combined in brass or bronze, has the same effect as tin and hardens the metal. Otherwise it has no injurious effect and cannot be noticed.

That iron, when not chemically combined, separates out in small, extremely hard shot, which injure tools when the castings are cut or drilled.

That phosphorus and zinc do not agree. If phosphorus is used in brass, composition or bronze containing zinc, it should be in very small quantity, not over one or two hundredths of a per-cent (0.01 to 0.02 per-cent). If a larger quantity is used, pinholes will be present in the castings.

That castings always come cleaner when poured from the bottom. This applies to large and small castings.

That metal containing aluminum, such as manganese-bronze, aluminum-bronze etc., requires a long gate to obtain a clean casting. Aluminum oxidizes upon exposure to the air and the metal containing it becomes "drossy" as it runs. A long gate retains this dross and it does not enter the casting.

That yellow brass containing aluminum can be used for many purposes and can be poured "flat" with a greater number of pieces on a gate.

That composition castings often shrink excessively because they contain too little tin. Tin in the brasses and bronzes reduces shrinkage.

That charcoal should be used on metal during the melting as it prevents oxidation and gas absorption with their accompanying difficulties consisting of blowholes in the castings and dirty metal.

That ingot metal made from scrap is as good as new metal provided it contains the same ingredients.

That sulphur is absorbed from fuel every time metal is melted and, therefore, is constantly accumulating.

That sulphur in brass and composition causes a dark skin in the sand casting.

That sulphur causes castings to become red-short and crack in the mold while cooling.

That risers on castings should cool last and feed it.

That copper melts more readily if scrap is put into the crucible with it.

That a little common salt is excellent in melting brass and composition as it reduces any oxide of copper that forms.

That metal should not project above the top of a crucible in melting. It will oxidize and absorb gases when it does, on account of the greatly exposed surface.

That the best way to melt is to have all the metal in the crucible come up to the same heat at the same time. Too slow melting or that which is too rapid is not as good as that in which no portion of the metal becomes heated above the desired pouring temperature.

That the finer the condition of a metal the more it will oxidize in melting. This is why fine copper wire never gives as good castings as those made from ingot metal.

Graphite crucibles should always be stored in a dry place. If stored in a damp place, they absorb moisture readily and scalp when placed in the fire. Scalped crucibles are always caused by dampness.

Bronze powders are made by pounding the finely divided metal, obtained by pouring the melted metal into water (shotting), under hammers. These hammers are of the well known type used in pounding ores and are worked by a cam.

## Why Graphite is Used in Crucibles.*

By Malcolm McNaughton.

Graphite of the kind used in the manufacture of crucibles, is a natural crystalline form of carbon. It is infusible at all temperatures, but volatile above 4500 degrees F. It has a low coefficient of heat expansian as compared with that of the other ingredients which make up the composition of the crucible. It is slowly oxidized, that is, consumed in the presence of air or oxygen at temperatures above 1000 degrees F. The rate of combustion is quite slow between this temperature and 1700 degrees, at which point the rate of combustion appears to increase quite rapidly. It is a good conductor of heat as compared with clay and other earthy materials contained in the crucible, so that a crucible containing 50% of graphitic carbon will conduct heat much more rapidly than a crucible containing no graphite whatever. These four properties, that is, infusibility, low coefficient of heat expansion, comparatively high conductivity and slow rate of combustibility, are all functions of its use in crucibles. It is not easy to place these in the order of their importance, because in different kinds of service this order would probably change. It will therefore be best to discuss each of these properties by itself.

*Infusibility.*—As most of the processes to which the plumbago crucible is subjected are carried on at temperatures below 3000 degrees F., the question of volatilization is not to be considered. At all temperatures graphite is infusible. As there is no difficulty whatever in making mixtures of fire-clay with other refractory materials which will stand temperatures up to 2700 degrees, the function of graphite in this particular, applies only to temperatures above this point. If we take a piece of crucible material and cover it with fine graphite so as to keep the air away, and subject it to a temperature even as high as 3300 degrees, we will not find any mass fusion. But if we remove the graphite by combustion, and then subject it to the same temperature, the mass melts readily. The action of the graphite in this instance is probably in the way of preventing the flowing of any particles which have started to melt over adjacent unmelted particles, and in this way no general fluxing occurs. This property is well illustrated in the case of crucibles used for melting steel in gas fires. After each heat the outside of the crucible is covered with a vitreous glaze, and immediately underneath lies the crucible wall in its original condition. The line of demarcation is absolutely sharp. The crucible when placed in the fire, passes through a temperature from 1000 degrees up to about 2700 degrees, during which time the graphite is being slowly burned from the outer surface of the crucible wall. As soon as the temperature reaches the melting point of this graphite-free material, it melts quickly, but without disturbing that portion of the wall where the graphite remains.

*Low Coefficient of Heat Expansion.*—If it were possible to produce a material which would not expand on heating and at the same time possess sufficient strength to withstand the necessarily severe use, crucibles made of such a material would be able to stand successive heatings and coolings indefinitely, without cracking. Anything which tends to reduce the coefficient of expansion of the crucible walls, tends to reduce the liability of failure from this cause, but this particlar point must not be considered by itself, but in connection with the third which is that of heat and conductivity.

*High Heat Conductivity.*—Since we do not possess such an ideal material as is referred to in the last paragraph, it is important that the difference in temperature in different parts of the crucible be kept as small as possible. Graphite enables us to do this to a very great extent. Thus, an inch cube of graphite crucible material placed over an electric heater at constant temperature, will pass heat through sufficient to melt a tin pellet in three minutes. Another cube of similar size in which the particles of graphite are replaced by similar sized particles of fire-sand, requires eight minutes in which to bring about the same result. The outside of a crucible when in a furnace, may be subjected to a temperature of 2500 degrees, while the inside of the crucible in close proximity to unmelted metal may be 1000 degrees lower. The outside of course expands in proportion to its temperature, so does the inside. This difference in expansion sets up a strain which of course tends to rupture the crucible. Without the use of graphite these differences would be much greater,

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*From *Graphite.*

especially at the beginning of the melting operation, and the likelihood of cracking of the crucible would be very much increased.

*Slow Rate of Combustibility.*—Many ask why a dense carbon, like retort carbon, could not be used in the manufacture of crucibles. It might of course with a relative degree of success, but as we have shown that as soon as the graphite has been removed, the remaining portion of the crucible is more easily fusible. It is important that the graphite does not burn away too quickly, for if it should do so, the rate of wasting away, due to fluxing, is materially increased. Retort carbon or coke would be consumed much more rapidly than the graphite, and therefore the crucible would be very much less durable. Furthermore, carbon of this sort is not so dense as graphite, and would conduct the heat very much less readily, and so increase the tendency to crack.

## Lead Steam Pipes for Warming Nickel Solutions.

Cold plating solutions do not work well and this is quite true of nickel solutions. Many plating rooms are badly heated and during the winter months the temperature may fall so that nickel deposits very slowly. It is, therefore, necessary to warm them. A temperature of 70° F. in winter is none too high for a nickel plating solution.

A common method of heating a plating solution is to run a steam pipe into it. This does very well, under some conditions, but it stirs up the sediment in the bottom and is not as good as a steam coil. The coil introduces no live steam in the solution.

It is a common error to use iron pipe for making a steam coil for a nickel plating solution. Lead pipe should be used. Nickel solutions always contain some free sulphuric acid and this attacks the iron and soon rusts it through. If the pipe happens to be galvanized, as it usually is, then the condition is worse. The zinc on the surface soon dissolves and greatly injuries the solution as it causes the nickel deposit to turn black.

Lead is not attacked by a nickel solution and should be used for steam coils in it.

## Cause of Dark Colored Nickel Deposits.

In nickel plating it is always the desire of platers to obtain as white a nickel deposit as possible. Although the desire exists, it is often found impossible to obtain such a white color, but instead, a dark shade is produced which does not prove satisfactory.

A dark nickel deposit may come from a number of causes:

1. From too strong current. A deposit, under such conditions, is black and rough on the edges of the article being plated. In other words, the current "burns" the nickel on account of being too strong. This variety of dark colored nickel deposit is very easily recognized and platers rarely have the difficulty as they know at once, by the appearance of the nickel deposit, what causes it.

2. The solution becoming alkaline. This is a rather frequent cause, particularly in plating rooms where the methods are inclined to be slovenly. It is caused by the introduction of potash or soda, from the cleaning kettle, into the nickel plating bath. The articles particularly if they are of such a shape that they have pockets in them, hold potash or soda which, if not thoroughly removed in the rinse water, enters the nickel solution, thus rendering it alkaline. A little acid, added to the solution will overcome it, of course, but it should not occur. The nickel deposit, when the solution is alkaline, is dark although even, and buffs well. It does not, however, have the desired whiteness.

3. Stoppage of current. This may occur by the dynamo stopping, or connections becoming loose. When the work remains in the solution in a half plated condition without any current running, it will gradually turn black. The remedy is obvious.

4. Copper in the nickel solution. This is a very common cause of a dark nickel and it is well known that copper will cause it. The copper may enter the solution in a number of ways: By work falling to the bottom of the tank and remaining there to be attacked and dissolved by the nickel solution; from copper in the nickel anodes; from copper plating solution introduced on the work that is to be plated in the nickel tank. This work is not sufficiently rinsed and some of the cyanide copper solution is carried over into the nickel. When the solution is contaminated with copper and is also alkaline, the deposit is quite black

5. Zinc in the nickel solution. This is introduced from brass that has fallen down into the tank and has dissolved in the nickel solution. In this case, both copper and zinc are introduced, but zinc alone, when present in a nickel solution, will cause a dark deposit.

6. Arsenic. This metal is often present in impure nickel, although it is rarely found in commercial nickel anodes. When present in a nickel solution, the deposit is dark.

Nickel deposits are always whiter when the solution is slightly acid and for this purpose boracic acid has been found the best. An acid solution, even though it may contain impurities like copper or zinc, will not deposit as dark nickel as though the solution were neutral.

The most common cause of dark nickel deposits is the presence of copper and frequently alkali with it. They are introduced from the cyanide copper solution. The work, usually steel, is plated in the cyanide copper solution, but is imperfectly rinsed and both the copper and the alkali are carried into the nickel bath. The remedy is to carefully rinse all work before it enters the nickel plating tank.

## Production of Metallic Iridium.

The source of metallic iridium is the powder left after the platinum has been extracted from the ore by the wet method. This iridium powder cannot be smelted alone, but must be converted into a phosphide in order to melt it and obtain it in a reguline mass. The iridium powder is heated in a silica crucible and pieces of phosphorus added to it until enough has been absorbed to convert it into the phosphide and render the mass liquid.

The phosphorus must then be removed and this is accomplished by heating the iridium phosphide with lime. The phosphorus is thus extracted and a white, brittle and very hard mass of metallic iridium is left which cannot be filed or cut, but in order to obtain it in small pieces it is broken by hammering.

The small pieces are used for the points of gold pens and are fused by means of gold solder to the points of the pens, after which they are ground with carborundum to shape and polish them. It is said that the iridium thus produced is about as hard as the ruby. The use for the points of gold pens is the chief one.

## An Improved Tilting Furnace.

An improved type of melting furnace has been patented by Edward S. Davis of Evanston, Illinois, for which considerable is claimed. The furnace is herewith illustrated in three views.

The furnace is of the tilting type and no crucibles are used in it. Oil or gas is used as the fuel and two burners are used, one on each side. The construction is such that the flame is not cut off during the tilting, but continues in the same manner as during the actual melting operation.

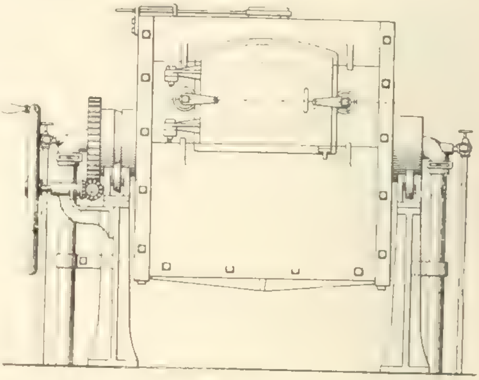


Fig. 1. Front View of the Furnace.

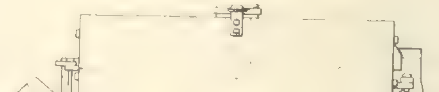


Fig. 2. Side View of the Furnace.

The metal is charged in the door at the front and this is also advantageous, the inventor says, for stirring or puddling the metal after it has been melted. The door is also permits charging the furnace at a lower level than in other furnaces of a similar type and, therefore, requires less manual exertion.

A feature of the furnace claimed is the fact that, during the pouring, the flame may be shut off from the vent in the top so that instead it issues from the spout and prevents the metal chilling during the pouring. Hotter metal can then be obtained and for some purposes and some kinds of metal, oxidation is greatly reduced or avoided.

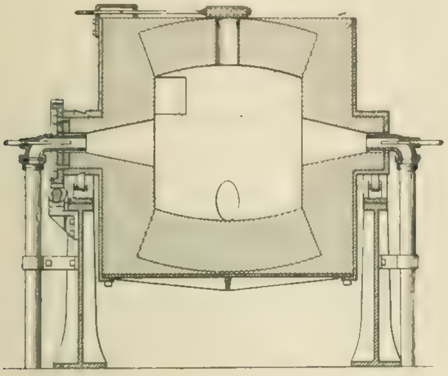


Fig. 3. Cross Sectional View.

## A New Process for Preparing Aluminum for Nickel Plating.

According to a patent recently issued to Quintin Marino of Golders Green, London, England, aluminum may be successfully plated if the following method is used for preparing it:

The surface is cleaned in a weak potash solution in the usual manner and then dipped into a nitric acid dip containing about 2% of nitric acid and the remainder water. This removes any iron that may have been left on the surface after the aluminum comes from the potash kettle. The next step is the essential feature of the patent and consists in immersion in a solution of a metallic fluoride of the metal that is to be deposited and containing potassium tartrate or other tartrate. If, for example, nickel is to be deposited on the aluminum, then nickel fluoride is used in the solution.

As an example of nickel plating, a 10% solution of sulphate of nickel is precipitated hot with a solution of carbonate of soda, producing carbonate of nickel. This is filtered out, washed and dissolved in just enough hydrofluoric acid to produce a neutral solution. About 1 part of this nickel fluoride is dissolved in 9 parts of water, making an approximately a 10% solution. To it is added 5% of potassium tartarate. The cleaned metal is immersed in this solution for a few seconds when a bright coating of nickel is produced. Nickel may then be deposited on this primary coating by the regular method.

Tin, silver, or copper may be deposited, the inventor states, in this same manner, by immersing the aluminum, previously cleaned, in the solution of the fluoride of the metal it is desired to be deposited. The inventor furthermore states that a weak current may be employed if desired when the immersion is taking place.

It is stated by the inventor that the metals thus deposited on the aluminum do not peel or blister and that the method of depositing the primary coating of metal insures the permanency of the deposit.

## Electrodeposition of Copper from a Nitric Acid Solution.

It is well known that copper cannot be deposited from a nitric acid solution of copper. J. H. Stansbie in the *Transactions of the Faraday Society* makes the following remarks in regard to it:

"It is practically impossible to deposit the whole of the copper from a solution containing nitric acid under ordinary conditions. The fact that nitrous acid is formed in the electrolysis and that this acid plays a very important part in the solution of copper by ordinary nitric acid, suggests a suitable explanation and a partial remedy for the difficulty."

"A series of experiments showed that the greatest deficiency in copper was found when the greatest amount of nitrous acid was formed. This latter can be greatly reduced by adding sulphuric acid, which may act in two ways:

1. The ions of the sulphuric acid, help to carry the current and thereby check the formation of nitrous acid.
2. The sulphuric acid unites with any nitrous acid to form a nitro-compound which has a smaller solvent effect on the copper.

# Questions and Answers.

QUESTION NO. 1237. Can you refer us to any literature upon the casting of brass and bronze in metal molds? We [illegible] the place of sand castings and not the simple shapes used for rolling into sheet. Has the casting of brass and bronze in metal molds been successfully accomplished in this manner and is it a commercial proposition?

*Answer.* There is no literature on this subject to which we can refer you. Brass and bronze have both been successfully cast in metal molds in some shapes, but others have been impossible to make. As a commercial proposition the casting in this manner does not seem to be a success on account of the tendency of the castings to crack in cooling. There are, however, one or two casting companies who claim to have solved the problem, but we have not yet seen any of their product upon the market.

QUESTION NO. 1238. We are troubled by steam condensing on our plating room roof during the cold weather and then dropping down on our finished work. Is there any method of stopping it?

*Answer.* We presume the steam comes from your potash and hot water kettles. If this is the case, then you can easily remedy it by putting a wooden hood over them. This hood should run up through the roof like a chimney and be of a good height so as to give a good draught. This will serve to remove the steam and the only cost will be the expense of erecting it. This is the method generally used for carrying off steam or fumes from dips.

QUESTION NO. 1239. We are making valve castings and find pin-holes in them when cut in two which, of course, causes leakage. We are buying ingot metal, made especially for valves, and this has a good appearance when broken in half. We have sent you a piece of the ingot broken in half and you will notice the fracture. Also notice the pin-holes in the section of a valve casting we have also sent you. Please let us have your opinion in the matter and whether the difficulty has been caused by the ingot or in the foundry.

*Answer.* Your difficulty has not been caused by the ingot metal but in melting. Pin-holes are caused by gas, which is absorbed during melting, and then expelled during cooling. Your metal was undoubtedly overheated or allowed to remain too long in the furnace after melting. The result is the same in either case. You should keep plenty of charcoal on the metal during the melting as this prevents any oxidation and absorption of sulphur from the fuel or products of combustion. Sulphur is one of the causes of blowholes and is absorbed from the fuel. Coal and coke always contain it and in the case of poor gases, a large quantity is frequently present.

QUESTION NO. 1240. Will you kindly inform us what formula is used for plating arsenic, and whether it is possible. If so, please inform us what has been done along this line.

*Answer.* Arsenic plates readily as deposited from a cyanide solution and is used in the electroplating industry for the production of black or gray finishes for French-gray work on silver, or for antique brass articles. The following solution can be used:

| | |
|---|---|
| Water | 1 gallon |
| Potassium Cyanide | 8 oz. |
| White Arsenic | 8 oz. |

The white arsenic (arsenious acid) is boiled or warmed with the solution of cyanide in water to dissolve it. A sheet steel or iron anode is used and the solution worked cold. Caustic potash may also be used instead of the cyanide. The difficulty with arsenic finishes is that they fade, owing to the oxidation of the arsenic upon exposure to the air. A good coating of lacquer, however, prevents this oxidation; but without it, an arsenic finish does not last long, particularly in damp air.

QUESTION NO. 1241. What is the advantage of cleaning brass casting by a sand-blast? We notice that some brass founders advertise the fact that they clean all their castings by sand-blast.

*Answer.* Metal cast in sand always has more or less of the sand adhering to it. It is the function of the sand-blast to remove it and produce a clean, uniform surface. Such a surface is very advantageous in case machine work is to be done upon the castings as the hard sand is very hard on tools. As appearance is the only thing by which material can immediately be judged by the eye, a lot of sand castings that have been sand-blasted will look much better than those which have not been treated in this manner. The sand-blast is of particular advantage on castings made from scrap or containing considerable lead, as these castings are usually coated with burned or fluxed sand to a greater extent than those made from new metal.

QUESTION NO. 1242. Is there any standard mixture for a tripoli composition used for cutting down brass and other metals? We would like to know what the formula is.

*Answer.* Every maker has a different formula for his tripoli composition and it is believed that few of them are the same. These formulas are the secret of the business and are carefully retained by the makers. The average composition of tripoli, however, is about the same. It is composed of tripoli (the natural, mineral product) with some fats or greases for the binder. The old fashioned tripoli contained tallow as the binder, but of late mineral greases and waxes have been used on account of their cheapness. Petrolatum is also employed in the composition. The object of the fats and waxes is to hold the tripoli together and this portion of the operation is the real secret of the composition. The tripoli itself is very often mixed with ground silex or quartz as this material cuts more rapidly than the tripoli itself. Such tripoli compositions are called "quick-cutting".

QUESTION No. 1242. Kindly let me know what is the cause of crucibles scaling in the fire. Is it the fault of the crucible or is the melter to blame?

*Answer.* The scalping or scaling of crucibles is caused by moisture in them. When the crucibles are damp and are placed in the fire, the steam which forms, forces off the outer surface with the formation of a scale or scalp. Any crucible can be scalped by soaking it in water and then placing directly in a fire that heats it rapidly. Under ordinary conditions, crucibles absorb dampness readily, and for this reason, they are quite apt to scalp when placed in a hot fire. They should be annealed by *gradually* bringing them up to a red heat, and after this they can be used without danger of scalping. All crucibles should be stored in a dry and preferably warm place like the top of a muffle or core oven. Crucible makers will not pay any attention to complaints about scalped crucibles as it is now universally acknowledged that the scalping is the fault of the user on account of not properly drying his crucibles or carefully annealing them before use. If this is done, no crucible will scalp.

QUESTION No. 1243. I am plating flat-ware and knives with silver and these have been silver plated before. They are re-finished in other words. I am having lots of trouble when I silver the steel knives. When scratch-brushed, the deposit shows blisters. The way I do them is as follows: I first potash them and then buff them down and afterwads scour them with pumice. They are then put in a muriatic acid dip and afterwards through a sal ammoniac and mercury solution. I then strike them in a silver stirke and run for 20 minutes in the regular silver solution. I should have said that I copper plate them before going to the silver strike. They blister, however, and I would like to know how to over come it as I have a lot of them to do.

*Answer.* Your method of plating the steel knives is wrong. You should first strip the silver from them or cut them down on a wheel to remove the scratches. If they are polished on a wheel, it is frequently unnecessary to strip them, although it is considered profitable on account of the silver obtained. Old steel knives usually require polishing to remove scratches. They are then cleaned in potash or other suitable cleaner, and then rinsed in cold water and immediately run through a muriatic acid dip. They are at once rinsed in cold water and then immediately plated. If this cannot be done then, they should be kept in a solution of sal-soda to keep them from rusting. It is the rusting of the steel that causes so much trouble in plating it. You will find it preferable to silver plate the knives without copper plating them. Copper is very apt to blister while the silver is not. Use two striking solutions as follows:

*First Strike*

| | | |
|---|---|---|
| Water .... | 1 | gallon |
| Cyanide .......... | 2 | lbs. |
| Silver Chloride ... | 1¼ | pennyweights |

After the knives have been put through the first strike, they go to the regular stirke, consisting of the following

*Second Strike*

| | |
|---|---|
| Water .......... | 1 gallon |
| Cyanide .................. | 8 oz. |
| Silver Chlirode ............ | ½ oz. |

The knives can then go to the regular silver plating solution. If you scour the knives with pumice before plating it is very efficacious and if careful to prevent rusting before plating you will have no trouble.

QUESTION No. 1244. What information can you give me in regard to casting brass for rolling? Is it cast in iron molds?

*Answer.* Brass to be rolled is always cast in iron molds as the metal is not good when cast in sand or other substances of a like nature. Cast-iron is used and it should be soft. A hard iron is apt to crack and the molds do not last as long. The brass is poured hotter than it would be for a sand casting, and the surface of the molds is coated with a slight film of lard oil.

QUESTION No. 1249. We are sending you two badges which have been gold plated. The one we plated ourselves and the other was plated by outside people. You will notice there is a difference in the shade of the gold deposit. Ours is not as good as the one done by the outside manufacture and we want to obtain the same color.

*Answer.* Your color is too "foxy". The other is more of the true Roman shade. It looks as if you had too much cyanide in your solution and were using too strong a current. Use your gold solution at about 150° F. and with a rather weak current and it will probably improve the color. Your deposit looks as if it was done cold. If you will advise us what you are using for your solution, we may be able to suggest improvements. Hot gold solutions, and those containing a little bi-sulphate of soda, give the best color.

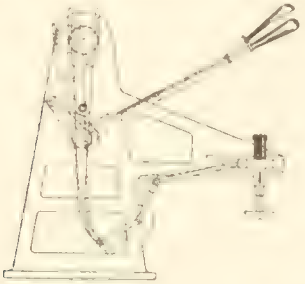
QUESTION No. 1250. What kind of metal is used for making imitation bronze figures or statutes? These are sold in large quantities with various bronze, gold or fancy finishes. We desire to manufacture some of them, but do not know what metal to use.

*Answer.* Two kinds of metals are used The cheapest and the one which casts the easiest, is called "antimonial-lead". It consists of 87% lead and 13% antimony. This mixture is employed for a large proportion of small metal goods found on the market, such as coffin-hardware, clocks, and novelties of a great variety. It is used on account of its cheapness and its good casting qualities. The other is pure zinc. This is used for the best grade of work. Only the purest grade of zinc can be employed and nothing is used with it. Both metals are cast in bronze molds.

## Patent Abstracts.

1,045,531, Nov. 26, 1912. COMPOSITION FOR MAKING GRINDSTONES. Robert Irving Dowd of Beloit, Wis. Grindstones are made artificially by the following composition: Portland cement, 2 parts; ground quartz, 2 parts; and washed sand, 1 part. These are mixed with enough water to set the cement and then rammed into a mold and allowed to set. After the cement is set, the mass is removed from the mold and allowed to stand a month. This is supposed to season the mass and harden it. It is claimed that the grindstone made in this manner can be used either wet or dry.

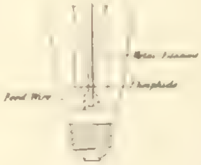
1,045,578, Nov. 26, 1912. MACHINE FOR POLISHING METALS AND PRECIOUS METALS. Richard Matthes and Richard Schirmer of Zeitz, Germany. The invention relates to a machine for polishing all kinds of metals, particularly gold, silver and platinum articles, and which is constructed in such a way that the polishing is not affected by a rotating motion. Instead, a reciprocating motion is given it. The forked shaped piece, shown in the illustration, and which is used to hold the work for polishing, can be regulated so that the polishing stroke can also be regulated.



1,045,878, Dec. 3, 1912. SHEET FEEDING MECHANISM FOR TINNING POTS. Edwin Kenneth Norton of New York City. A device for feeding steel or iron sheets to a tinning pot for making tin plate. The feature of the patent lies in the fact that the sheets can be fed closely, with one following the other and with only a small clearence space between them. In this manner the oil finishing rolls are kept constantly filled with the sheets and do not become covered with patches of dross and scruff. Wasters are thus reduced.

[illegible] Dec. 3, 1912. MOLD. William Sudekum of Nashville, Tenn. The mold is for casting packing rings for steam engines and other forms of machinery. Soft metal is used. Rings of any cross section are possible by adjusting the mold. It is claimed that the rings will be of uniform quality and may be cast very cheaply, as far as labor is concerned.

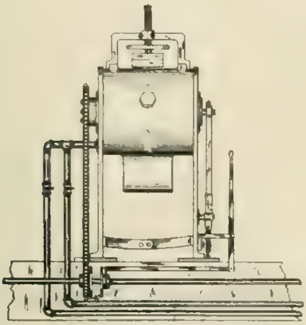
1,046,780, Dec. 10, 1912. CONNECTION BETWEEN METALLIC FILAMENTS AND FEED WIRES OF ELECTRIC INCANDESCENT LAMPS. Franz Hanaman of Budapest, Hungary. Assignor to the General Electric Co. of Schenectady, N. Y. The invention relates to the connection between the filament of an electrical lamp and the feed wires. This connection can be made in the open air so that no oxidation will take place. A phosphide is used and also most any metallic phosphide will give good results. Those of nickel, copper, manganese, chromium, tungsten, etc., are mentioned. The phosphide is placed on the wire and connection joint and fused. The low fusion of the phosphide allows the joint to be easily made.



1,046,933, Dec. 10, 1912. METHOD OF HEATING SHEET BARS. Thomas V. Allis of Middletown, Ohio. A method of heating bars used for rolling into sheet and which are rolled while in the heated condition. The essential feature of the invention is in the economy in heating space in the furnace and the method of advancing the bars along the furnace longitudinally.

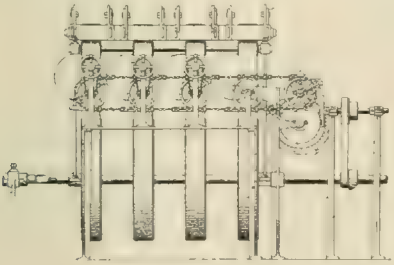
1,046,240, Dec. 3, 1912. ELECTRIC WELDING MACHINE. Frank Warren of Cincinnati, Ohio. Assignor to the Toledo Electric Welder Co. of Toledo, Ohio. This machine has been designed for use in stove welding, but may be used for other work, such as the welding of boxes if desired. An adjustable die is used, removable and capable of being mounted in different positions to adapt it to the work to be done

1,045,738, Nov. 26, 1912. DIE CASTING MACHINE. Layton M. Parkhurst of Indianapolis, Ind. Assignor to the Indiana Die Casting Development Co. of the same city. A die casting machine in which the melting pot turns on a swivel. When closed and turned over, the metal is forced by a plunger into the die. Freedom from oxidation is thus claimed. The machine and process are adapted for metals with a low melting point, like babbitt-metal and the zinc base alloys generally employed for making castings.



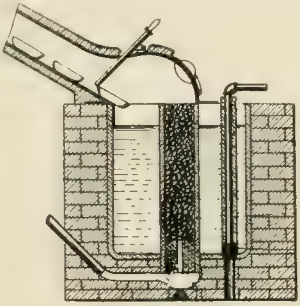
1,043,328, Nov. 5, 1912. ELECTROLYTE. William H. Lowe of Brodesbury, England. Assignor to the Float Electric Co. An electrolyte for battery use and which consists of 28 oz. of bichromate of soda, 18 oz. of concentrated sulphuric acid and 5 oz. of common salt. Water is added to this as desired. The bichromate of soda and the sulphuric acid form a hard mass which can be ground with the salt and kept dry, and then dissolved in water as desired.

1,045,945, Dec. 3, 1912. GRINDING AND POLISHING MACHINE. William J. Carney of Norwich, Conn. The machine is used for grinding a number of small articles at once. It is applied particularly to grinding knife blades and those which are used for table cutlery are adapted for it. The machine is intended to supplant hand work upon this class of goods.



1,046,436, Dec. 10, 1912. TUBE ROLLING APPARATUS. Richard E. Brock and William M. Selkirk of Monessen, Pa. Assignor to the Pittsburgh Steel Products Co. of Pittsburgh, Pa. The process is upon the manufacture of seamless tubing and relates more particularly to the handling of the mandrel bars. The blank is forced through the rolls on to the mandrel bar, and this bar is then withdrawn in the opposite direction to which the tube was passed through the rolls. The tube is thus released from the mandrel so as to permit it to be passed back to the receiving side of the rolls.

1,046,828, Dec. 10, 1912. METAL MELTING FURNACE. Cyril Douglas McCourt of Streatham Common, London, England. Assignor to the Radiant Heating Company, Ltd. of Leeds, England. A furnace for melting brass, copper, bronze aluminum, etc. The heating of the metal is carried on by radiation. Gaseous fuel is used for the heating.



1,044,264, Nov. 12, 1912. PROCESS OF MAKING COMPOUND RODS OR WIRES. Eduard Schürhoff of Weissensee, near Berlin, Germany. A process of making a compound copper wire, containing a shell of copper and a core of aluminum. A copper tube, of sufficient thickness, is heated in a furnace to about 1000° C., an aluminum core is then forced in and the whole heated until the aluminum begins to melt. The aluminum and copper then welded together. The compound billet thus produced is rolled and drawn in the usual manner to produce wire.

1,054,957, Dec. 3, 1912. TUBING. William Dicks, of Buffalo, N. Y. A tubing made of sheet metal, but particularly of sheet steel and which is adaptable to the manufacture of bedsteads, ladders, poles, posts and the like. The sheet is folded in and drawn so as to make a reinforcement inside to strengthen it. The shapes are made by drawing through suitable dies

# Trade Items.

Work has been started on the new factory of the Waterbury Buckle Company of Waterbury, manufacturers of metal buckles and similar metal goods. This will be [illegible] x 123 feet and three stories high.

A new factory is being built by Joseph K. King & Co. of Newark, N. J., manufacturers of jewelry. This factory is located at 8 Rose St. The present location is at 14 [illegible] St. A new line of 14 karat and platinum jewelry will be added to their product.

A new factory is to be erected by the Dancyger Safety Pin Company of Cleveland, Ohio. This will be located at 4707 Detroit Ave. and will be [illegible] x [illegible] feet and three stories high. The cost is to be approximately $25,000.

The plant of the Toledo Metal Furniture Co. of Toledo, Ohio is to be rebuilt and extensions made which will give them double their present capacity. A main building, 60 x 175 feet is to be erected. The electroplating and polishing rooms are to be likewise enlarged.

The Empire Radiator Company has been incorporated in Buffalo, N. Y. with a capital stock of [illegible] and will combine with the Electrolytic Products Company, now situated at Elmwood and Hertel Aves. The plant will be enlarged. Radiators for automobiles are to be manufactured by an electrolytic process and which has been carried on by the Electrolytic Products Company for some time.

The name of the Sterling Manufacturing Co. of Hartford, Conn., has been changed to the Rowe Calk Co. This company manufactures horseshoe calks and the office is at 20 Pearl St. and factory at 46 Mechanic St. The Rowe Calk Company have for some time owned the controlling interest in the company and the name has now been changed to the manufacturing department. This company carries on electroplating and brass plate the steel calks.

The "Rockwell" annealing furnaces which are now being manufactured by the W. S. Rockwell Company, 50 Church St., New York City have many advantages. These are supplied in the automatic or semi-automatic type. The semi-automatic type is adapted for many classes of annealing as the material is annealed in trays. Large or small metal goods may be treated. The advantages are: Uniformly heated material; large output; continuous annealing with low labor and fuel cost; cleanliness of the product; accurate control of the temperature. There are no chains or conveyors exposed to the heat and the maintenance of the furnace is low. These furnaces can be furnished for burning coal, coke, oil or gas. The W. S. Rockwell Company not only build the furnaces but install them ready for operation.

A new factory is to be built at Marion, Ind. by the [illegible] Mfg. Co. for the manufacture of safety razors. Other specialties will also be made. The office of the company is in the Fisher Building, Chicago.

The receivers' report in regard to the affairs of the [illegible] Company of Philadelphia, Pa., [illegible], shows that the assets of the company are $53,806 with labilities of $38,230. Of the assets, $51,000 is in stock and fixtures.

John S. Underwood of the Underwood Typewriter Co. of Hartford, Conn., has started to manufacture adding machines and has equipped a factory in the Chamber of Commerce Building on Hawthorne St. in that city.

The new Parcels-Post now in existence, cannot fail to help the manufacturer in small and [illegible] towns where it has been difficult to obtain prompt shipments. It is possible to send small lots of supplies so that they will be received promptly and at a low cost. This will be particularly true of plating supplies of many kinds.

The Meaker Company, Fulton & Elizabeth Sts., Chicago, Ill. announce that the cost of galvanizing can be cut down at least 50% over ordinary costs by the use of their electrogalvanizing process. They manufacture automatic appliances for electrogalvanizing all classes of iron and steel products. A deposit of pure zinc is obtained from their solution which does not scale or peel. More than twenty of the largest manufacturers of bolts and nuts are now using their process and appliances.

The Compania Mexicana de Petroleo El Aguila, S. A. has perfected plans for a large crude oil refinery near Tampico, Mexico. It [illegible] first of this year and will have a capacity of 12,000 barrels per day. The oil will be used principally for fuel purposes and will have a flash point of over 150° F. and a viscosity of under 1000. The equipment will be purchased partly in Europe and partly in the United States. It will have a much larger capacity than that of Waters-Pierce refinery in Tampico.

When in the market for polishing supplies, the Easton Polishing Supply Mfg. Co. of Easton, Pa. should be given the opportunity to quote. They manufacture wood leather covered wheels for the special requirements of the polishing trade, special flanges for wheels and make a large variety of wheels for every requirement. Canvas wheels, solid or stitched and special canvas belting wheels are manufactured. Paper wheels are supplied in either the hard or soft condition. Special bullneck wheels are one of the selected products of this company. Emery pastes, emery printers' ink buffs and many other lines are constantly [illegible] for immediate shipment.

Whipple & Choate, Bridgeport, Conn., manufacturers of ingot metals, are making a large variety of special ingot alloys. These include valve-metal, manganese-bronze, German-silver, phosphor-bronze, yellow-brass, red-brass, composition and bearing metals.

Manufacturers who have occasion to cut circular or oval blanks of glass, celluloid, paper, metal, etc., should investigate the merits of the "Starr-Springfield Circle and Oval Cutter" made by the Shawver Company of Springfield, Ohio. This machine is inexpensive and cuts circles up to 22 inches in diameter and ovals of a larger size.

The Munning-Loeb Company of Matawan, N. J. are placing on the market a new and novel alloy for making electrical contact joints. This is used in place of solder and is called "Plastic Alloy". A booklet is published on the subject giving the method of using it, its value ,etc., and which will be sent upon application to them. This book should be in the hands of all platers.

Chas. F. L'Hommediu & Sons Co., 24 South Clinton St., Chicago, Ill., are headquarters for everything needed in the polishing, buffing or plating room. Their well known "Reliance" dynamos, motor-lathes, rheostats, wheels, tumbling barrels, etc., are now very extensively used in the trade. The "Reliance" plating barrel manufactured by them is different from anything else on the market as it is of the oblique type and small quantities as well as large amounts may be readily plated in it and the plating operation watched.

The Zueker & Levett & Loeb Company, which is now located at the Bush Terminal No. 1, Brooklyn, N. Y. is now prepared to supply everything for the polishing and plating trades and all goods are made after the original formulas of the old company, and upon which their reputation was built up. The formulas and patents of the old company are owned by this new one and all goods will be made under the personal supervision of H. L. Haas, the present treasurer and general manager, who for many years was connected with the old concern. The New York office is at 132 Nassau St.

The nickel manufactured by the United States Nickel Company of New Brunswick, N. J. is now being used by the Government for the manufacture of nickel coins at the Philadelphia mint. This very fact indicates that the nickel is of high purity. This nickel is over 99% pure and is made from New Caledonian ore of a standard and regular purity. It has been known for a long time that New Caledonia ores have been free from the injurious impurities of other nickel ores, and the nickel that has been made in France from them for a long time has been noted for its purity. This company is prepared to take care of any size orders and customers will be taken care of. The success with which this nickel has met indicates that it has obtained the approval of German-silver makers, anode makers and others who use nickel.

The Michigan Cash Register Co. of Detroit, Mich. have awarded the contract for their new three story factory which will be 60 x 130 feet and will cost $20,000. It will be located at Fifth and Porter Sts.

The Damard Lacquer Co. of New York City, makers of the well known "Damard Lacquers" which are now meeting with such success in the trade, have moved their offices to 29 West 42nd. St. in the Aeolian Building.

James L. Anthony, 212 Union St., Providence, R. I. has purchased the business and plant of Alfred C. Noyes, 33 Eddy St. in that city, manufacturer of bronze dies. The business will be carried on by Mr. Anthony. Chasing and designing are also carried on in addition to the manufacture of dies.

The Connecticut Electric & Mfg. Co. of Bantam, Conn. have moved to their new factory recently built in Bridgeport, Conn. and manufacturing has already commenced in it. This factory is located on Connecticut Ave. and is of modern brick construction The new factory gives the company increased facilities for manufacturing. Electrical specialties are manufactured. A new plating room has been equipped.

A new and novel hack-saw blade is being placed on the market by Alexander Reitlinger, 201 William St., New York City. The teeth in the saw run both ways so that the cutting is done by both the forward and return strokes. The saw can be used in both hand and power hack-saw frames and it is claimed that the cut is clean and made faster. When the saw is used in a power frame, the blade can be reversed when it ceases to cut freely in one direction.

Attention is called to the polishing, buffing and dust collecting outfit manufactured by Leiman Bros., 62K John St., New York City. This outfit is of the latest improved type and is shipped complete, ready for work. Two polishing heads are used and these are covered by hoods connected by a powerful exhaust fan. The outfit is operated by a motor. For polishing or buffing the precious metals, this outfit is particularly well suited as the dust is saved and may be sold. They are used by manufacturing jewelers very extensively and never fail to give the utmost satisfaction.

Adolf Neubeck, 126 Fifth Ave., New York City, is placing on the market the celebrated "Prometheus" nickel plating salts manufactured by Dr. Frederick Neubeck of Germany. These salts can be used for plating nickel on all metals and deposit it with extreme rapidity. The time required for depositing a given quantity of nickel, it is stated, is one-third that required with the ordinary nickel plating solution. In addition, the deposit is very white and soft and adheres with great tenacity. The "Vulcan" nickel plating salts is another product of Dr. Neubeck and is used for barrel plating. For plating steel cutlery, etc., a special grade known as "Konstantia" is produced. Samples will be sent upon request.

The Webster & Perks Tool Company of Springfield, Ohio, manufacturers of grinding, polishing and buffing machinery, are sending out their new catalogue to the trade describing the various lines of machines which they manufacture. The catalogue comprises thirty-one pages and is profusely illustrated.

F. W. Peckham, 88 Dorchester, Mass., manufacturer of brass, bronze and aluminum castings, as well as special mixtures, is now advertising on his letter head that "all castings are cleaned by the sand blast." This seems to be a step in the right direction and indicates that modern practice is creeping into the brass foundry.

The Anthony Company, Long Island City, N. Y. are sending out to the trade, their new catalogue describing their new oil furnaces and burners. These have recently been greatly improved and are now more efficient than ever before. Their burners are of the low pressure type. The catalogue will be sent to those who desire it and is well illustrated and compiled.

The regular monthly meeting of the National Electroplaters' Association was held on Dec. 26th. 1912 in New York City and thirty-one members attended. Three new members were elected. A paper was read by E. W. T. Faint, in charge of the plating department of the Singer Mfg. Co. of Elizabeth, N. J. on the advantages of the "Persels" and "Prometheus" salts for electroplating and their advantages over the regular nickel solution. Mr. Haddow exhibited a nickel anode that had been used in a Prometheus solution and had a clean reduction.

The Waterbury Hair Spring Company, Inc. has been incorporated in Waterbury, Conn. to manufacture springs for watches and other similar classes of goods requiring such articles. A specialty will be made of phosphor-bronze springs. The president of the company is George Hartley, the well known manufacturer of [illegible] wire. The vice-president and general manager is Thomas Mahony. C. H. Hartley is the secretary and treasurer. Messrs. Hartley were the first to manufacture hair spring wire in this country. Mr. Mahony was connected with the Waterbury Clock Co. for 25 years.

The banquet of the Chicago branch of the National Electroplaters' Association was held in Chicago on Dec. 14th. at the Hotel Morrison and one hundred and thirty nine members were present. Addresses were made by the President, J. H. Hansjosten, who was also the toastmaster of the evening. Prof. Charles F. Burgess of the University of Wisconsin delivered an address on the "Application of Chemistry to Electroplating" and Dr. Oliver P. Watts of the same University presented a very interesting paper on the "Microspoic Structure of Electrodeposition". H. E. Willmore delivered an interesting address and then exhibited a collection of work showing over 200 different finishes. Oscar E. Servis is the secretary of the Chicago association.

The Royal Silver Co., 46 Oliver St., Newark, N. J. are seeking a site as they have outgrown their present quarters.

A new factory is to be built by the Toledo Computing Scale Company of Toledo, Ohio, at Windsor, Ont. About $80,000 will be spent and the factory is to be four stories high [illegible] x 200 feet.

The name of the Gaynor & Mitchell Mfg. Co. of Bridgeport, Conn. has been changed to the Gaynor Mfg. Co. but no change in the management has been made and the business remains the same. A new factory was recently built by them in Stratford, Conn., but the business address still remains in Bridgeport. The manufacture of small brass goods is carried on including press work and stampings from sheet metal.

The success that the copper clad steel wire made by the Duplex Metals Co. of Chester, Pa., is meeting with is evidenced by the fact that the Beacon Light Co. of that city and the fire alarm system are to be equipped with this wire. The wire is composed of steel and coated with copper so that the high electrical conductivity of the copper is obtained together with the strength of the steel.

The Trumbull-Vanderpoel Company have been organized in Bantam, Conn. and has started to manufacture electrical spcialties such as switches, sockets, etc. The business of the Empire Electric Mfg. Co. of Plainville, Conn. and the Blake Electric Mfg. Co. of Boston, Mass have been purchased. The officers of the company are: President, Charles F. Flynn; vice-president, George Trumbull; and secretary-treasurer, Floyd Vanderpoel.

The Bennett-O'Connell Company, 3600 South Morgan St., Chicago, Ill., manufacturers of polishing and plating supplies and equipment wish to call the attention of the trade to their "Ball-Bearing Polishing Lathe" which has many attractive features. They state that they are superior to the ordinary polishing lathe and full information of this new product will be set upon application. The Cleveland office of the company is at 1111 Superior Viaduct.

The International Smokeless Powder & Chemical Co., 140 Cedar St., New York City have added a lacquer department to their plant at Parlin, N. J. and are now in a position to supply all kinds of lacquers to the trade. This list of lacquers includes all the formulas for the cotton lacquers and those containing gum. This company is controlled by the E. I. Dupont de Nemours Powder Co. of Wilmington, Del. and they have been manufacturing these products for the wholesale trade for some time. The manufacture of smokeless powders requires the manufacture of soluble cotton and its solvents, so that this company has the best of facilities for producing the goods which they are now placing on the market. Their organization includes experts in the manufacture of lacquers and the same high quality that has characterized "Dupont" goods will be maintained.

An addition to the plant of the Estate Stove Works of Hamilton, Ohio is to be built. This addition is to be 50 x 176 feet and five stories high.

The name of the Gem Mfg. Co., Chelsea, Mass., has been changed to the Gem Stamped Steel Company. The manufacture of stamped and pressed steel metal goods is carried on.

The plant of the National Brass & Iron Co. of Reading, Pa. has been purchased by the Gray Iron Foundry Company of that city. The brass and iron foundries will be re-equipped and the manufacture of brass and iron hardware novelties will be carried on. A new addition, it is also stated, is to be built. The plant of the National Brass & Iron Co. is situated at Tulpehocken and West Green Sts. The company went out of business some time ago.

G. J. Nikolas & Co., 1227 West Van Buren St., Chicago, Ill., the well known manufacturers of lacquers, are sending out a propel-pencil to the trade, finished with the lacquer enamels. These enamels produce a finish equal to the baking enamels and are not so apt to chip. G. J. Nikolas & Co. report their sales for 1912 exceed those of the previous year by 40 per-cent. They are now carrying 30,000 gallons of lacquer in stock so that immediate shipments can be made. Their distilling capacity has been increased 200 per-cent.

The "Persels" nickel plating salts, made by Waldberg & Co., Ltd. of Paris, France, proved so satisfactory for nickel plating that it is now being introduced into this country by B. O. Bowers & Co. (Chemical Dept.), 6 Harrison St., New York City. They state that it has always replaced every other nickel salt wherever tried. They say that it gives a very bright deposit that is non-porous and homogeneus. On highly buffed surfaces no buffing is required. There is a great reduction in the time of depositing the nickel and the anode efficiency is stated to be unprecedented. Nickel platers should all investigate its merits. It will prove valuable to them.

Attention is called to the use of Titanium-Copper for producing pure copper castings of high conductivity. Titanium, while one of the most recent additions to the list of deoxidizers, is one of the most widely distributed elements in nature. It is only recently that it has been supplied in a form that could be used. The Titanium Alloy Co. of Niagara Falls, N. Y., after many experiments, have succeeded in producing and alloy of titanium and copper which can be used for introducing titanium in all copper alloys. It is possible, by the use of titanium, to produce sound copper castings of from 85 to 97 per-cent electrical conductivity, depending upon the purity of the copper used. Titanium, in addition to having a very strong affinity for oxygen, likewise has an affinity for nitrogen, which is absorbed by metals during melting. It performs a complete purification of the metal, theerfore, into which it is introduced

The Wheeler Bros. Brass Foundry has been incorporated in Troy, N. Y. with a capital stock of $15,000. The directors are Joseph and Henry Wheeler.

The Presco Mfg. Co. was recently incorporated in Cleveland, Ohio with a capital stock of $15,000 and will manufacture automobile lamps and automobile accessories. A plant has been established at 112 Hamilton Ave.

George S. Youngs, Bridgeport, Conn., manufacturer of the well known "Y" brand of ingot brass, bronze and composition, has sent out a large and very attractive calendar to the trade.

Merritt Merwin, treasurer of the newly formed Bennett-Merwin Silver Co. of New Milford, Conn. recently lost his life in a singular manner. His necktie became caught in a revolving shaft and choked him to death.

The plant of the Lorain Brass & Bronze Co. in Lorain, Ohio, has been placed in operation and brass, bronze and aluminum castings will be manufactured. The plant is located at Washington Ave. and Nickel Plate R. R. This company was recently organized.

The Middle States Company has been incorporated in Erie, Pa. with a capital stock of $60,000 and will operate a foundry for making brass, bronze and aluminum castings. The president of the new company is M. W. Brundage.

The Reliable Refininshing Company of New York City have moved to 545 West 22nd. St. where they are still carrying on their established trade of replating and refinishing metal goods for the trade. All goods are refinished, when they require lacquering, by means of "Damard" lacquers.

## Personal.

Harry R. Linton, formerly with the Means Foundry & Machine Company of Steubenville, Ohio, has become associated with the Rector Gas Lamp Company, 131 West 31st. St., New York City and will have charge of their purchasing department.

Charles H. Poland, who for twenty-seven years has been connected with the White Mfg. Co. of Bridgeport, Conn., lamp manufacturers, and for the past ten years as foreman of the plating and polishing departments, has severed his connection with the company and has accepted the position as superintendent of the Jennings Bros. Mfg. Co. of Bridgeport, Conn., manufacturers of soft metal novelties.

H. E. Willmore, the well known electroplater of Chicago, Ill. has associated himself with the Acme Steel Goods Co., 2834 Archer Ave. and has taken charge of the plating department. Mr. Willmore was formerly in charge of the plating department of the Chicago Hardware Company of North Chicago.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98-99% | ℔. | .22 |
| Acid, Acetic, pure, 30% | ℔. | .07 |
| Acid, Arsenious (White Arsenic) | ℔. | .20 |
| Acid, Benzoic | ℔. | .55 |
| Acid, Boracic (Boric), pure | ℔. | .12 |
| Acid, Hydrochloric, see Acid, Muriatic | | |
| Acid, Hydrofluoric, 30% | ℔. | .04 |
| Acid, Hydrofluoric, 50% | ℔. | .10 |
| Acid, Muriatic, 20° | ℔. | .02 |
| Acid, Muriatic, c. p., 20° | ℔. | .07 |
| Acid, Nitric, 38° | ℔. | .05⅝ |
| Acid, Nitric, 40° | ℔. | .05⅞ |
| Acid, Nitric, 42° | ℔. | .06¼ |
| Acid, Nitric, c. p., | ℔. | .08 |
| Acid, Sulphuric, 66° | ℔. | .01¾ |
| Acid, Sulphuric, c. p. | ℔. | .06 |
| Alcohol, Wood | gal | .50 |
| Alcohol, Denatured | gal | .55 |
| Alum | ℔. | .04 |
| Aluminum, Metallic, in Ingot | | .26½ |
| Ammonium Sulphate | ℔. | .07 |
| Aqua Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | ℔. | .04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | ℔. | .06¼ |
| Ammonia Water, c. p. | ℔. | .08 |
| Ammonium Carbonate, lump | ℔. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | ℔. | .12 |
| Ammonium Hydrosulphuret | ℔. | .30 |
| Ammonium Sulphate | ℔. | .07 |
| Ammonium Sulphocyanate | ℔. | .50 |
| Amyl Acetate | gal | 3.50 |
| Antimony | ℔. | .09¾ |
| Arsenic, Metallic | ℔. | .10 |
| Arsenic, White (Acid Arsenious) | ℔. | .20 |
| Argols, White (Cream of Tartar) | ℔. | .31 |
| Asphaltum, Commercial | ℔. | .05 |
| Asphaltum, Egyptian (Bitumen) | ℔. | .30 |
| Benzine | gal | .15 |
| Benzol, Pure | gal. | .50 |
| Bismuth, Metallic | ℔. | 2.25 |
| Bitumen, see Asphaltum. | | |
| Blue-Vitrol, see Copper Sulphate | | |
| Borax, Crystals or Powdered | ℔. | .10 |
| Borax Glass | ℔. | .35 |
| Cadmium, Metallic | ℔. | .85 |
| Carbon Bisulphide | ℔. | .10 |
| Calcium Carbonate (Precipitated Chalk) | ℔. | .10 |
| Chrome-Green | ℔. | .50 |
| Copper, Lake (carload) | ℔. | .17¾ |
| Copper, Lake, (cask) | ℔. | .18 |
| Copper, Electrolytic, (cask) | ℔. | .17¾ |
| Copper, Electrolytic, (carload) | ℔. | .17¼ |
| Copper, Casting, (carload) | ℔. | .17⅜ |
| Copper, Casting, (cask) | ℔. | .17⅝ |
| Copper Acetate (Verdigris) | ℔. | .35 |
| Copper Carbonate, dry | ℔. | .25 |
| Copper Sulphate (Blue-Stone) | ℔. | .09 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | ℔. | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | ℔. | .15 |
| Emery Flour | ℔. | .04 |
| Emery, F F & F F F | ℔. | .03 |
| Flint, powdered | ℔. | .01 |
| Flour-Spar | ℔. | .01¼ |
| Fusel-Oil | gal | 3.50 |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | ℔. | .30 |
| Gum Guiacum | ℔. | .26 |
| Gum Mastic | ℔. | .70 |
| Gum Sandarac | ℔. | .35 |
| Gum Shellac, brown | ℔. | .50 |
| Gum Shellac, white | ℔. | .60 |
| Iridium | oz. | 63.50 |
| Iron Perchloride | ℔. | .25 |
| Iron Sulphate (Copperas) | ℔. | .06 |
| Lead Acetate (Sugar of Lead) | ℔. | .15 |
| Lead, Pig | | 04⅜ |
| Lead, Red | ℔. | .12 |
| Lead, Yellow Oxide (Litharge) | ℔. | 12 |
| Liver of Sulphur, see Potassium Sulphide | | |
| Manganese, Ferro, 80% | ℔. | .10 |
| Manganese, Metallic, pure | ℔. | .75 |
| Magnesium, Metallic | ℔. | 1.50 |
| Mercury Bichloride (Corrosive Sublimate) | ℔. | 1.16 |
| Mercury, Metallic (Quicksilver) | ℔. | .40 |
| Mercury Nitrate | ℔. | 1.50 |
| Mercury Oxide, yellow | ℔. | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | ℔. | .08 |
| Nickel Carbonate, dry | ℔. | .60 |
| Nickel Chloride | ℔. | .50 |
| Nickel Metallic | ℔. | .45 |
| Nickel Sulphate (Single Salts) | ℔. | .12 |
| Nitre (Saltpetre), see Potassium Nitrate | | |
| Oil of Vitriol, see Acid, Sulphuric | | |
| Paraffine | ℔. | .15 |
| Phosphorus, yellow | ℔. | .40 |
| Phosphorus, red | ℔. | 1.10 |
| Pitch | ℔. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Chloride | oz. | 23.00 |
| Platinum Metallic | oz. | 48.00 |
| Potash by Alcohol, in sticks | ℔. | .50 |
| Potash, Caustic | ℔. | .05½ |
| Potassium Bichromate | ℔. | .14 |
| Potassium Bitartarate (Cream of Tartar) | ℔. | .31 |
| Potassium Carbonate (Pearlash) | ℔. | .10 |
| Potassium Chlorate | ℔. | .15 |
| Potassium Cyanide | ℔. | .25 |
| Potassium Iodide | ℔. | 2.25 |
| Potassium Nitrate (Nitre or Saltpetre) | ℔. | .10 |
| Potassium Permanganate | ℔. | .17 |
| Potassium, Red Prussiate | ℔. | .60 |
| Potassium, Yellow Prussiate | ℔. | .24 |
| Potassium Sulphide (Liver of Sulphur) | ℔. | .15 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | ℔. | .70 |
| Pumice, Ground | ℔. | .05 |
| Quartz, Powdered | ℔. | .01 |
| Rosin, Yellow | ℔. | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .63½ |
| Silver Nitrate, crystals | oz | 50 |
| Soda-Ash | ℔. | .05 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | ℔. | 15 |
| Sodium Carbonate (Sal-Soda), crystals | ℔. | .02 |
| Sodium Hydrate (Caustic Soda) | ℔. | 05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | ℔. | .45 |
| Sodium Hyposulphite ("Hypo") | ℔. | .04 |
| Sodium Metallic | ℔. | .90 |
| Sodium Nitrate | ℔. | .05 |
| Sodium Phosphate | ℔. | .09 |
| Sodium Silicate (Water-Glass) | ℔. | .04 |
| Soot, Calcined | ℔. | .15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | ℔. | 05 |
| Tin Chloride | ℔. | .43 |
| Tin, Metallic | ℔. | .50⅝ |
| Turpentine, Venice | ℔. | .35 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal. | 15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | ℔. | .45 |
| Wax, Carnauba | ℔. | .70 |
| Whiting (Ground Chalk) | ℔. | .02 |
| Zinc, Carbonate, dry | ℔. | .19 |
| Zinc, Chloride | ℔. | .12 |
| Zinc, Sulphate | ℔. | .06 |
| Zinc, (spelter) | ℔. | 07⅜ |

# THE BRASS WORLD AND PLATERS' GUIDE

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## The Treatment of Skimmings in Small Brass Foundries.

The treatment of skimmings in small brass foundries is a subject that has never received as much attention as it should. Years ago, it was customary to throw them away, after picking out the large pieces of metal and spatters, but of late many founders have been accustomed either to throw their skimmings into their ashes and sell or wash them, or to wash the skimmings separately or, possibly sell them direct.

There is a way of treating brass skimmings that will bring the greatest profit to the brass founder and it requires no plant to do it. If the skimmings are treated in this way, they will show a much less loss.

Skimmings from both yellow and red brass consist of the following:

1. Oxides of copper and zinc.
2. Pieces of metal and spatters of considerable size.
3. Small shots of metal.
4. Charcoal.
5. Pieces of coal or coke used as the fuel for melting.
6. Slag and scale from the crucible.

Let us see what will happen when the skimmings are washed with water. Oxides are washed away, the charcoal and coal or coke are likewise crushed and washed out, while the slag and some of the very fine metal likewise disappear. There is then left nothing but the clean metal. This clean metal has a good appearance and to the uninitiated it at first appears that good values have been obtained from the skimmings. Such, however, is not the case.

The metallic oxides and fine metal are washed away and lost. Therefore, much of the value of the skimmings is actually thrown away. The right method to treat the skimmings is as follows:

Riddle them through a rather fine riddle, say 20 mesh or thereabouts, and save what goes through it. This contains the oxides and fine metal that cannot be used and will run from 20 to 40 per cent of copper. It always has a good market value and those who handle copper bearing material for smelting into copper will always purchase it.

What is left in the riddle are the coarse pieces of metal, charcoal and slag and coke. The large pieces of metal can be easily picked out and the coal or coke, together with the slag may also be hand picked. There is so little of it that it is not a difficult job. After this has been done, what is left can be put directly back into the crucible. The charcoal will be advantageous in melting and the large pieces of metal are thus saved. The fine material which has been riddled out is the only material that need be saved.

## Painting Wood Tanks Before Lining.

For some purposes, wood tanks may be used without any lining, but for use in electroplating it is always preferable to line with pitch, asphalt or other substance of a like nature which will prevent the action of the plating solution on the wood and not only prevent decay, but offset the entrance of organic matter from the wood into the solution itself.

When pitch or any similar substance is used for lining the tank, it is usually poured on hot and then "ironed" into the wood by a flat-iron heated so that the pitch will melt. In this manner it is presumed that the melted material will be forced into the pores of the wood. This is not always the case for the reason that the pitch will not penetrate readily, even when heated and the result is usually that the coating is merely smeared over the surface and does not penetrate the wood at all. The final result is that the pitch, having nothing to which to cling, flakes off and the bare wood is exposed.

It has been found expedient to paint the wood tank with a thin asphalt paint, previous to applying the pitch, as it penetrates the wood, protects it and also supplies a hold for the lining melted on with the flat-iron. Asphalt paint has been found the best for this purpose for two reasons: First, it is not attacked by any plating solution any more than the pitch lining itself. Second, it dries rapidly.

Ordinary asphalt paint of commerce is used and if too thick it can be thinned with turpentine. It is well to use rather thin as it then penetrates the wood better. By all means see that the wood tank is dry before painting. Many platers make a mistake in attempting to line a damp tank. Nothing will hold under these conditions. If possible, give several coats of the asphalt paint, allowing each one to dry before applying the other. The paint dries in a few hours to a hard surface.

When the asphalt paint has dried, apply the pitch lining in the usual way and it will be found that it adheres better and the wood is protected in a more thorough manner.

Sodium, when present in metallic aluminum, causes it to corrode rapidly, depending upon the amount present. When aluminum was made by reducing the chloride by metallic sodium, the aluminum obtained contained considerable and explains why some of the early samples of this metal turned white so rapidly when exposed to the air. Aluminum produced at the present time contains very little sodium as an impurity.

Unless purified in the wet way, the only method for removing impurities from gold is by the use of nitre. This is thrown on the surface while the gold is melted and the impurities are oxidized and slagged off. Nitre, however, will not remove silver and any copper present is removed with difficulty. Arsenic, antimony, iron, lead, sulphur, bismuth, tin, zinc and aluminum are all easily removed by nitre. Nickel, however, is oxidized only with great difficulty. The most satisfactory method of purifying gold that contains considerable impurity is by the wet method.

# The "Gamm" Oil Reverberatory Furnace for Melting Nickel.

The melting of nickel, either for the manufacture of nickel anodes or for rolling into sheet, has always been a difficult matter, although special crucible furnaces have been used by some manufacturers. The ordinary crucible furnace, employed for melting brass is unsuited for this purpose as there is not sufficient heat generated for the purpose.

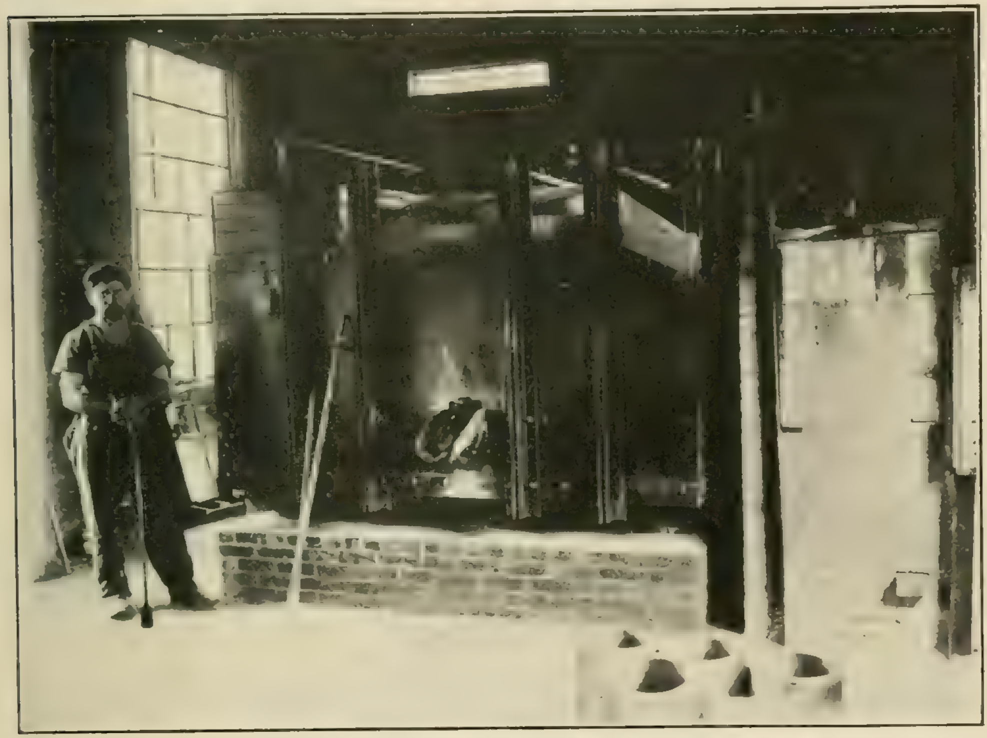

Fig. 1. The "Gamm" Reverberatory Oil Furnace Designed and in Use for Melting Nickel to Be Cast into Nickel Anodes.

There has recently been placed on the market a reverberatory furnace for melting nickel which has been attended with excellent success. Although primarily intended for melting nickel, however, this furnace, has been adapted for melting other metals and for calcining, roasting and other purposes. As it was first used for melting nickel, those early constructed were employed for this line of work.

The furnace, photograph of which is shown in Fig. 1 and a cross-section in Fig. 2, is designed for burning fuel-oil, but is unique in that it employs no blast of air or steam for promoting the combustion of the oil, but makes use of the natural draught of an ordinary stack in the same manner that it is utilized for burning coal or coke. So far as known, this feature is not utilized by any other form of oil furnace.

Early in the history of steel castings, oil furnaces were constructed for melting the steel, and one of the earliest was that employed in the manufacture of the so-called "Mitis" castings. These castings were, perhaps, the predecessor of the steel castings of today and were made by melting wrought-iron scrap or, in reality heating it as hot as it was possible and so that it was melted but not in in a fluid condition, and then adding a small amount of aluminum to it. The aluminum, uniting with the iron, generated, by the so-called heat of reaction, a sufficient rise in temperature to bring the iron to a very fluid condition so that it could be cast into molds. The furnace employed used oil for the fuel, and natural draught, but owing to its construction, the heat generated was not satisfactory and much difficulty was experienced in obtaining satisfactory and uniform results.

The oil furnace using natural draught thus passed out of existence and it was not until H. F. E. Gamm of the Oil Furnace & Engineering Co., 60 Liberty St., New York City modified the furnace in a marked degree that the principle of natural draught became utilized again in a commercial manner. Mr. Gamm designed a new form of burner so that a more complete combustion is obtained and modified the furnace so that the heat is economized in a better manner.

In the furnace, ordinary fuel-oil is used, and it is stated that low grade oils, which are difficult to use in other forms of furnace, may be utilized. The oil is led to the burners in a pipe and is made to flow either by gravity or by small pressure from an underground tank. The burners used are of a special type invented by Mr. Gamm and upon which a patent has been applied for. They are of cast-iron and of a shallow pan design. The oil flows into them, is immediately volatilized by the heat and burns in the combustion chamber of the furnace. The novel feature of the furnace is the air duct underneath the burner to allow the entrance of air for the purpose of forming complete combustion. By this means, it is possible to burn the oil so that the maximum heat possible is obtained.

With the burner it is possible to obtain a heat up to 4000° F. The oil is carried, after it has volatilized from the burner and forms a rich, hydrocarbon gas, between two currents of air by the natural draft of the chimney and drawn into the narrow combustion chamber where it is burned with complete combustion. One of the novel features of the furnace is the method of controlling the air so that perfect combustion results. In oil furnaces of previous types, in which the fuel was burned by natural draft, the air was not under control and the result was an incomplete combustion and a carbon deposit around the burners and passages. It is claimed by the makers of this type of furnace that the oil is so completely consumed, no carbon deposit at all forms. The temperature of the flame is controlled by changing the air inlets, and also by the cold air inlet in the escape flue, thus reducing the draft.

A stack, of course, is necessary for operating this type of oil furnace, but one of medium height only is necessary. From 50 to 75 feet, depending upon the location, is ample. In a valley, where the draught is poor, a larger stack is required than in a place where the building, in which the furnace is situated, is exposed. It is a remarkable fact that only a light draught is required and this is quite an important advantage in the treatment of fine material where a blast would cause it to be blown away. It is stated that no trouble is experienced in working oxides that have passed through a thirty mesh sieve. Dust chambers are, therefore, unnecessary when the furnace is employed for this class of work.

The furnace, shown in Fig. 1, indicates the general outward appearance. In Fig. 2 a cross-section of this type of furnace is illustrated. The metal is melted upon the bed of the furnace by the oil flame which passes over it in a direct manner after which it goes to the

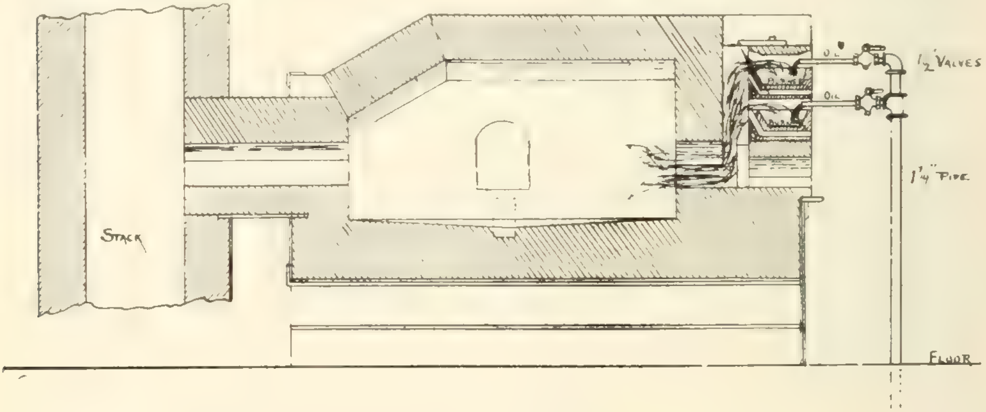

Fig. 2. Cross-Section of the "Gamm" Reverberatory Furnace.

flue as seen in Fig. 2. The charging door is at the side of the furnace and the metal is tapped out, the spout for this purpose being shown in Fig. 1. The bed of the furnace is inclined towards the tap hole so that the metal will run out easily when the tap hole is opened.

One of the features of the furnace lies in the absence of danger from any overflow of oil. This might take place in the furnace on account of opening the oil valves too far. The oil then overflows the pans. The oil simply flows into the air passages and burns, generating a large volume of flame, but doing no damage. No smoke can be seen issuing from the chimney under such conditions which indicates the completeness of the combustion under even these most severe conditions.

To start the furnace, the oil is allowed to flow into the pan and then a small piece of burlap or waste is lighted and thrown on the surface. The oil begins to burn and as soon as the pan becomes warm, the combustion proceeds in the regular manner. Like all large masses, the furnace takes some time to heat, but this fact is true of any fuel and any large furnace. It is believed, however, that with this form of furnace and burner, the melting will take place more rapidly than any other reverberatory furnace of a similar type.

The heat generated in the furnace is sufficient for melting all commercial metals and nickel, which, is well known, is one of the highest melting metals, is easily melted and reduced to a fluid condition and poured into any desired form, either in sand or metal molds. It is now being used very successfully for the casting of nickel anodes.

A furnace of this type is used by the International Nickel Company at Bayonne, N. J. for melting nickel and this is the largest furnace in existence for this purpose. In it 70,000 lbs. of nickel are melted at a time. This size, however, is exceptional and the makers build furnaces as small as 500 lbs. for commercial work and, in fact, it is designed to meet any requirement from the smallest 500 lb. requirement up to the largest size previously mentioned.

The furnace is equally well adapted for melting copper, German-silver, bronze and brass and, in fact, any other material which is difficult to melt in the ordinary way. It may be of interest to state that glass is very readily melted in the furnace.

The manufacturers of the furnace are now engaged in designing smaller types of furnaces in which crucibles will be used so that founders will then be able to utilize, when necessary, all the advantages of crucible melting when the matter of hot metal for making small castings is required.

## Making Up a Small Gold Solution.

Making up a small gold solution is usually a difficult job for the plater who has no equipment for it. He finds it taxes his patience to "cut" the gold and make it into chloride or cyanide. It frequently happens, if the gold has not been properly dissolved in the aqua-regia, that the chloride of gold contains too much acid and then the solution made with cyanide and the chloride is not satisfactory. Taking everything into consideration, the production of a gold plating solution, although simple matter that it is theoretically, is not as attractive as it would appear.

The porous cup method of making a gold solution is the best method known, and it to be recommended. The gold does not require "cutting" with acid, but is simply placed in the cyanide solution in the jar or stone crock, a piece of carbon placed in the porous cup and the current started. The gold dissolves in the solution but does not pass through the porous cup.

The gold, therefore, requires no "cutting" or dissolving in acid and the process of making the solution is very simple. In addition, karat golds can be used, if desired, and any desired alloy may be employed by simply using it instead of the fine gold.

This method of making up a gold solution is so simple that the most inexperienced person can use it, and it is to be recommended, particularly when small solutions are to be used, as they generally are for the majority of gold plating done.

Blisters on metal plated in a cyanide copper or a brass solution are caused by either too much free cyanide in the solution or too strong a current. Both may act together and cause blistering

## Use of Metallic Cerium in Preventing the Corrosion of Aluminum.

Aluminum is distinguished by many advantages; among which its wide occurrence and consequent comparative cheapness, its lightness and its conductivity of electricity immediately present themselves. Its lack of strength has been largely corrected by alloying the metal with nickel, magnesium and so-called cothias metal, but little has been done in making the aluminum less liable to oxidation. Both mechanical and chemical resistance are undoubtedly influenced for the worse by the occurrence of mere traces of impurity remaining in the metal from its manufacture or taken up in subsequent meltings

In searching for metals which, when alloyed with aluminum, would retard its corrosion, in fact render it more noble, Dr. Wilhelm Borchers, of Aachen, and Otto Barth, of Oker am Hartz, have discovered that cerium and some of the accompanying metals have the desired property. Large quantities of cerite and monazite are worked up for the extraction of thorium salts which find their way to the incandescent mantle factories, while the oxides of cerium, lanthanum, praseodymium, neodymium, and samarium, separated from the complex mixture, have so far found very little industrial application. Cerium, on account of the comparatively large quantities of it which are available, has received the greatest attention, and proposals have been made for using its salts as mordants or drugs, but any more extended use of the metal or its compounds would be very welcome.

That cerium would alloy with aluminum was already known; the discovery of Messrs. Borchers and Barth is that such an alloy is less liable to corrosion than non-alloyed aluminum, and they have patented a process by which such resistant alloys can be produced (German Patent 246484). The alloy may be made directly during the electrolytic reduction of the alumina, or it may be made from ordinary aluminum without the help of the electric current. In the first case aluminum is produced by adding its oxide in as pure a condition as possible at regular intervals to a bath of molten halides of aluminum, and the metals of the alkalies and alkaline earths whilst a current is passed through the fused mass. The modification consists in adding, either continuously or intermittently, a small amount of the fluoride of a cerite metal to the aluminum oxide which is being reduced. To add more than 2 per cent. of the fluoride to 98 per cent. of the aluminum oxide is uneconomical and unnecessary, as in this case the resultant metal will contain 0.3 to 1.0 per cent of cerium, which is more than is required.

When it is required to alloy already reduced aluminum with cerium, the former is heated to about 1,000°C., i. e., several hundred degrees above its melting point, and addition made of the fluoride of a cerite metal either by itself or in admixture with other salts. The affinity of fluorine for aluminum and the metals of the cerium group do not appear to be very different, and the reversible reaction between aluminum, cerium fluoride, cerium and aluminum fluoride comes to a halt when about 1.5 per cent. of the cerium metal has been alloyed with the aluminum

It has been found that in practice 0.05 per cent. of cerium is sufficient to exert a beneficial effect on the properties of aluminum, and that the benefit increases up to 0.2 per cent. of cerium, after which it diminishes.

The explanation of the effect of the cerium seems to be found in the diminution in the silicon content. Thus, a crude aluminum had its content of silicon reduced from 0.106 to 0.02 per cent. by the addition of 0.05 to 0.10 per cent. of a cerite metal and the physical properties of the aluminum were greatly improved at the same time. Silicon dissolves in molten aluminum, but separates on cooling, much in the same way that graphite separates from cast iron; the intrusion of the silicon crystals between the aluminum crystals then reduces the strength of he metal. At the same time the cerite metal also affects the structure of the aluminum to a certain extent.—*The Ironmonger*

Tungsten has the highest melting point of any metal and little is known about its alloys with copper.

Manganese has more affinity for sulphur than any other metal and when added to molten metals combines with it forming manganese sulphide which rises to the top as slag. It is quite probable that manganese owes its value as an addition to molten metals partly to the removal of sulphur as well as in reducing any oxide that may be present.

# The Electrolytic Etching of Brass.

The etching of brass is carried out in the ordinary way by means of perchloride of iron, nitric acid, or potassium chlorate and muriatic acid. Each of these etching liquids is open to objections. Perchloride of iron, although excellent in the respect that it may be used with practically every resist and has no action on it, is quite slow and the etching requires some considerable attention, the solution must be constantly rocked and unless much supervision is had over the process, the operation is apt to be attended with poor results. The chief objection to perchloride of iron is its slow action on brass. Nitric acid is open to the objection that it gives off gas while acting on the plate and the bubbles escaping from the surface of the plate are apt to lift the resist. In addition, obnoxious fumes are given off. It also has some action on the resist. The potassium chlorate and muriatic acid give a good etch and one that is fairly rapid, but the fumes given off are very irritating and dangerous and, therefore, this method of etching is rarely employed.

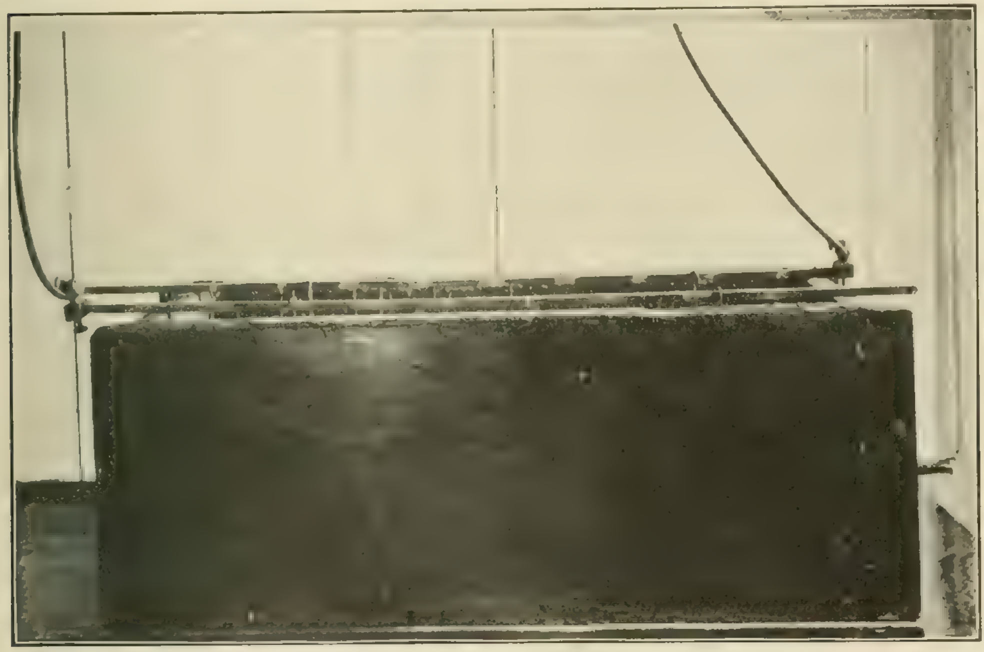

Fig. 1. Method of Etching the Brass Electrolytically.

The electrolytic method of etching has always been quite attractive and has been more or less extensively used, particularly in making name plates and similar articles, but little information is to be obtained about it from text books. The process is simple and requires little attention, and an etch of any desired depth may be obtained. The electrolytic process seems to be particularly well adapted for brass and is to be recommended.

In the electrolytic etching of brass, the process employed is the same as that used in plating, except that the brass to be etched is made the anode. The solution used is the important portion of the operation, and when this is made in the right manner, the etching becomes quite simple.

There are many solutions which can be used for etching brass electrolytically, but the simplest and cheapest is a dilute solution of sulphuric acid in water. Unless the resist is acted upon by sulphuric acid (and this is very seldom the case), the solution is, apparently equal to any. It is used so dilute that it will not attack the ordinary resist and the etching proceeds regularly and satisfactorily. A 10% solution of sulphuric acid in water is used.

In the use of a simple solution of sulphuric acid in water for electrolytic etching, gas is given off from the cathode; but not from the anode (the brass being etched) unless the current density exceeds what it should. This evolution of gas at the cathode at the low current density advisable for etching can, however, be avoided by the addition of a small amount of nitric acid to the solution; and it is this sulphuric and nitric acid solution that is recommended for etching by means of the electric current. The nitric acid may be left out, if desired, and the results are good as far as the etching is concerned. The nitric acid in the solution is used simply to prevent the evolution of gas at the cathode during the etching.

The following solution has been found excellent for the electrolytic etching of brass:

| | |
|---|---|
| Water ................. | 9 gallons |
| Sulphuric Acid ...... . | 1 gallon |
| Nitric Acid . .. .. | 1 quart |

The sulphuric acid is the regular commercial acid of about 66 Beaume strength. A slight variation in the proportions do not affect the results, although it is well to keep within reasonable limits.

The solution is made up by pouring the sulphuric acid *into* the water. Water should *never* be poured into sulphuric acid as the acid, being heavier stays at the bottom of the vessel, and the water remains on the top of it. Heat is then generated at the junction of the two liquids with the formation of steam which violently throws the whole out. Bad burns thus frequently result. When the acid is poured into the water, heat is generated, of course, but uniformly. It is always preferable to stir or shake the solution when being mixed.

When the sulphuric acid and the water have been mixed, it will be found that the liquid is hot. It should then be allowed to cool as it will melt the resist from the brass to be etched if employed in this condition. Etching solutions are always used cold.

When cool, the nitric acid is added to the mixture of sulphuric acid and water and the whole thoroughly mixed. No fear need be entertained when the nitric acid is added as no heat is generated and it may safely be added to the solution direct. The solution is now ready for etching.

A wood tank is used for etching and it should be preferably coated with pitch or asphalt. An ordinary wood plating tank is suitable. Iron tanks cannot be used for this solution. For small work, of course, glass or enamel tanks can be used, but only for small pieces.

The brass to be etched is given a suitable resist by any of the desired methods. Either the painting on, transfer or photographic method may be used. The etching solution is suitable for any of these processes. The preparation of the brass surface is carried out in exactly the same manner as though the etching was to be done without the use of the electric current and in the ordinary manner, say with perchloride of iron. Care should be taken to protect all parts not to be etched by suitable varnish. This portion of the etching process, however, is not a matter that concerns us here. Let it be said, though, that care should be taken to have the surface of the brass clean before applying the resist and in a smooth condition desired after etching and leaving the "high-lights" exposed subsequent to removing the resist.

The brass to be etched is used as the anode in the solution and the cathode may be brass or copper. The cathode should be of the same size, as far as exposed surface is concerned, as the anode. The distance between the anode and the cathode need not be great and a few inches more or less are satisfactory. In this manner it is possible for a large number of plates to be placed in a tank. The connections are made in the same manner as for electroplating. If a long plate is to be etched, such as that shown in the illustration, then connections should be made at both ends in order to equalize the current, and the same rule applies to the anode connections.

If the etching is to be carried on a commercial scale, the solution should be agitated while the etching is going on. In this manner the solution is constantly mixed and stratification is prevented. The action on the plate is also more even. In the case of small solutions, or those only occasionally used, the agitation may be accomplished by stirring. Agitation is not absolutely necessary, however, in case plenty of solution is used, but it is conducive to good results.

In practice, to agitate the solution, air is excellent. A lead pipe (iron cannot be used), is immersed in the solution near the bottom and air constantly blown through it by means of a blower run by power. All that is required in the way of air pressure is an amount sufficient to cause bubbles to issue from the end of the pipe gently. Rapid bubbling is usually unnecessary unless the solution is overworked.

To begin the etching, the brass is connected as the anode and the current started. The exposed surface of the brass or that to be etched should be clean as the solution does not work evenly if a film of grease is present. It is frequently a good plan, to pour some dilute nitric acid over the face of the brass before immersion in the tank and allow to "bite" a second. This removes the grease and oil films which may be present and gives a clean surface for the action of the etching solution. The acid should be rather dilute, say 2 parts of water to 1 part of acid. Pour over the surface and allow to remain until "biting" begins. Then immediately rinse off in cold water under a faucet. If this strength of acid does not bite readily, use less water, but care should be taken not to use the acid too strong or the resists will be attacked. The use of this acid, previous to beginning the etching, will depend upon the resist used and the cleanliness of the plate. With asphalt or transfer wax, it may be employed, but with the photographic method in which albumen or gelatine is used, it is well to omit it. In the latter case, the surface of the brass to be etched is usually quite clean.

The plate having been immersed in the etching solution and the connections made and current started, is watched for a few minutes and the progress of the etching noted. At first the brass remains apparently unaffected, but in a short time it begins to become dull and the etching is well under way. If the plate is clean, the etching will take place uniformly all over the surface of the exposed brass, but if not, the action is uneven and the plate should be taken out and cleaned in some manner, if possible. For this reason the action of the etching solution should be watched for a few minutes when the current is first started.

The current strength is of much importance in etching by this process and must be carefully regulated if good results are desired. Too strong a current will give a rough surface, but if well regulated a fine, matt-etched brass will be obtained.

A voltmeter and a rheostat are necessary for the successful performance of the operation. If the voltage is carefully regulated and maintained at the right amount, the etching goes on evenly and successfully. Not over 1 volt should be used and if kept at this amount, there can be no question about the results. The current density will then be kept right no matter how large or small amount of work may be in the tank. At this voltage and the solution made up according to the formula previously given, the current density will be about 1 ampere per sq. in. of anode surface.

In the case of small solutions, or those which contain a large quantity of plates to be etched, care must be taken to avoid heating during the etching process. The current passing through the solution gradually heats it on account of the resistance offered and in the case of a small amount or that which is worked "hard", considerable heating may result after a time. If this is the case, then the resist may frequently be melted off.

The etching is allowed to go for some time

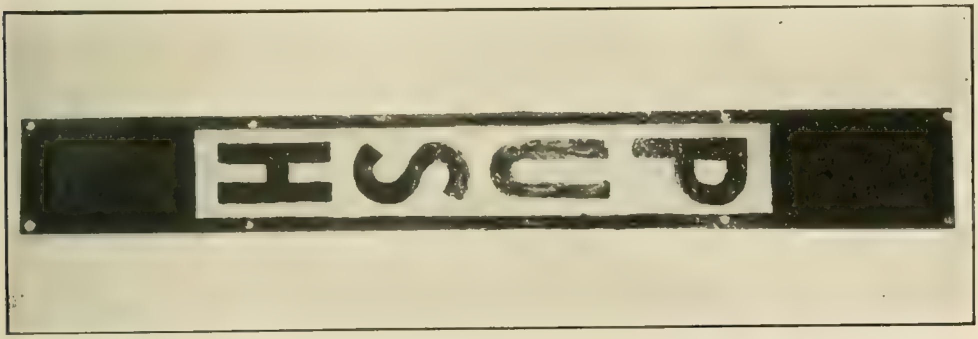

Fig. 2. The Brass Before Etching and With the Resist On.

when it will be noticed that a film is forming over the surface of the brass being etched. This gradually becomes thicker, as the etching goes on, and finally begins to break away in spots, exposing the clean brass underneath. This film is produced by the impurities in the brass which do not dissolve in the solution.

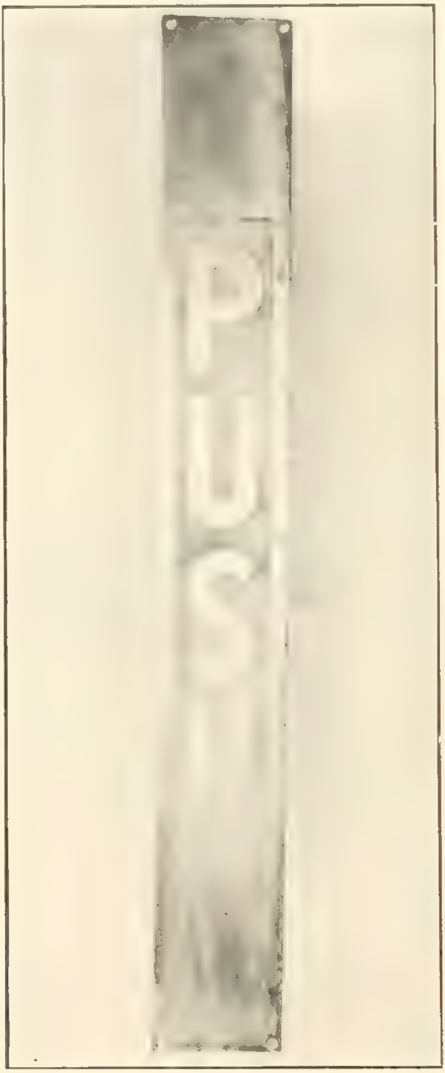

Fig. 3. The Brass Plate After Etching Electrolytically.

Lead is the principal impurity and the film is composed mainly of it. When the film begins to break away in this manner, it is well to take the brass plate out and rinse off in cold water under the faucet. This will usually wash it away, but if not, take a clean camel's-hair brush and brush over the surface while wet. This will always remove the film and not attack the resist. The water, however, will usually remove it without the necessity of using the brush. The removal of this film will leave the brass underneath bright and even and allow the etching to go on in the desired manner. In case only a comparatively light etch is desired, this treatment for the removal of the film may be omitted, but for deep etching it should be carried out.

The effect of too strong a current in etching is readily ascertained by the appearance of the brass as it is being etched. Rough patches form on the surface and gradually build themselves up into ridges. This seems to be some copper or zinc salt, possibly basic which resists the action of the acid. If these ridges are allowed to remain, the brass is not attacked underneath and an uneven surface remains after the etching has been completed. The substance on the brass in the form of these spots or ridges may be removed by taking the plate out and rinsing off in water. This procedure seems to dissolve it and leaves the brass clean. When such a phenomenon is discovered during the etching, it indicates that the curent is too strong and it should be cut down.

The length of time consumed in etching will, of course, depend upon the depth of the etch required. About half an hour will give a good, light etch, but deep etching may take all the way from three to ten hours. This, however, is no objection as the operation goes on uninterruptedly and without any difficulty. From time to time, in deep etching, it is well to remove the plate and examine for places where the resist may have come off; and in case it is discovered that any portion is removed, the plate should be rinsed off in water and allowed to dry completely. The portions, from which the resist is removed can then be touched over with a varnish to protect them. A good varnish for this purpose is asphaltum dissolved in benzol (not benzine). This varnish dries in a few seconds and leaves the asphaltum on the surface which is an excellent resist. In ascertaining whether the resist is removed, it is well to examine the plate early in the etching process for the reason that if the etching is allowed to go on after the resist is removed, the brass at this portion will be exposed and etched and will then be beyond repair. In case a good job is done in applying the resist, however, any retouching, during the etching operation is usually unnecessary.

After the etching has been completed, it will be found that the etched portions will have a fine, matt surface. If, however, the brass was pitted or scratched before etching, these pits or scratches will still be noticeable. To obtain the best results, the brass should be smooth, although not necessarily polished. A very fine matt surface is the best condition for the brass previous to etching and before applying the resist, as the resist then holds better. A highly polished or buffed surface is not as good, as the resist is then more apt to flake off during the etching operation.

In case it is desired to give the etched plate a black background, two methods may be used for producing it. Both are used before the resist is removed. The first is by means of a black nickel solution and is the best. The plate, after it comes from the etching solution and has been completed, is rinsed off in cold water and then transferred to a black nickel solution without removing the resist. The black nickel is then deposited on the background or etched portions. It will not deposit on the resist. After a good color has been obtained in the black nickel solution, the resist is removed by any suitable means, depending upon its character, when the brass "high-lights" will be left with a black background.

The second method consists in depositing copper on the brass plate, after etching, and before the resist has been removed, and then oxidizing in liver of sulphur, using a cold solution. The copper is deposited from an acid copper solution and when a good thickness has been obtained (from 10 to 15 minutes are usually a sufficient time), the whole is oxidized in liver of sulphur and the resist removed, leaving the exposed brass and the black background. The whole is then lacquered.

Nickel plating direct on zinc is not particularly successful from a commercial standpoint, and nearly all manufacturers who have occasion to nickel plate the metal first copper plate or brass plate it and then nickel plate over it.

## *The Treatment of the Refuse from Brass and Copper Mills.

At the usual monthly meeting of the Birmingham Section of the *Institute of Metals* on December 10, there was an important discussion on "The Treatment of Waste Products from Brass and Copper Works." Mr. A. Spittle (Kingston Metal Works, Smethwick), who opened the discussion, said that the materials to be dealt with were the products of volatilization, fluxing and skimming molten metals, oxidation during annealing, and erosion of metal during pickling, and included rich copper scale, inferior copper scale, mill dirt and sweepings, waste pickle, casters' skimmings, pot chippings, and ashes.

### *The Recovery of Copper.*

In works where the equipment included a copper smelting and refining plant the recovery of copper was a simple operation. The waste material, after odd pieces of metal had been picked out, was charged into the smelter and the copper recovered through the refinery. Where no such plant was available, however, it was generally necessary to sell the materials to other people who could smelt them. In any case it was desirable to keep the metallic contents of the waste as high as possible, and on no account should low-grade material be mixed with rich.

Rich, or best scale, should be kept free from dirt by storing it carefully. It should be well dried by spreading it on pans over a flue or on the top of a muffle. The removal of moisture not only reduced the weight of the material and so increased the percentage of copper, but lessened the cost of carriage and put the material in a form more acceptable to the smelter.

Inferior scale, such as that scraped from drains or gutters, or collected from boshes in which brass was pickled, usually contained about 20 per cent. less copper than best scale, owing to the presence of dirt, zinc oxide, sulphate, etc. That material should not be mixed with the best scale; but the same precaution should be taken for the removal of moisture and useless materials.

Mill dirt and sweepings, which usually contained much foreign material, should be burnt

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*We are indebted to *The Ironmonger* for the notes upon the discussion.

[illegible] matter and then passed over a fine riddle to facilitate the removal of bits of iron or cinder, and to enable the larger pieces of metal to be recovered and passed to the scrap bins. Any clinkers that were likely to contain valuable metal should be ground in a mill and afterwards mixed with the ashes.

Waste pickle was an unsatisfactory product to sell, because the acid manufacturers, who [illegible] tained a fairly large percentage of copper and was well worth treating. An ingenious process [illegible] lytically, removing the copper as it was dissolved [illegible] add only a small quantity of fresh acid from time to time in order to keep the bath in working order, had lately been introduced, but it [illegible] night.

### Other Methods.

Another method of recovering copper from waste pickle was that of precipitation by means of scrap iron, finally adding lime to remove the last traces. The precipitate was readily salable, although it contained [illegible] 50 per cent. of iron and impurities. By that process, however, the acid was rendered valueless and difficult to dispose of because the authorities would not allow it to be run into drains or poured into the canal.

A further method was to concentrate the solution by boiling, and recover the copper as copper sulphate by crystallisation on cooling. By that process they recovered both the copper and the free acid, which could be returned to the pickle boshes. It entailed the provision of boiling and cooling vats, however, and also required the constant services of an attendant.

In dealing with casters' skimmings and chippings and ashes, it was desirable to keep the two former from the last-named, because they were richer in metal. They should be ground and sieved or washed to recover the shots and larger pieces of metal.

Ashes should be kept free from coke. They should, in fact, be carefully hand-sorted. It was a mistake to make the ash-heap a general dumping place for anything that might contain a fraction of metal. Well-sorted ashes [illegible] were a marketable commodity; but if mixed [illegible] of metal, the material was made useless.

### *A Hint from Germany.*

Mr. G. A. Boeddicker said it would be possible to treat waste pickle successfully by the electrolytic method if they could use a soluble anode, but they were obliged to have an insoluble anode (carbon), and that necessitated a current of at least 2 volts per vat, which made the process too expensive. He was sorry Mr. Spittle had not touched upon the utilisation of waste heat. He had noted that in a German works the chimneys of the anneal[illegible] The heated air between the chimney and the outer [illegible] drawn away and utilised for warming the various departments of the works. It was a nice arrangement, costly in the first instance: but he was told that it paid in the long run. In dealing with casters' ashes the greatest difficulty was to get at the metallic contents. In grinding and jigging they produced a quantity of fine dust which would not survive any washing process. They really wanted a concentrating table, or something of that kind.

Mr. George Bean suggested that it might be practicable for firms engaged in the metal trades to form a small company to deal with the waste products of the trades on co-operative lines.

Mr. John Earle said it paid a manufacturer to recover his own by-products twenty-five years ago, but he did not think it paid him to do so now. The firms who bought the waste products to-day were well-established firms who made a careful study of their business and were able to get the utmost out of the materials, and, consequently, were prepared to pay good prices for them. There was the further objection that in doing their own refining they obtained metals containing such impurities that they could not use them in their own works, but had to dispose of them at a loss. The best method of treating waste pickle, he thought, was reduction by iron.

### *Treatment of Ashes.*

Mr. Johnstone thought the best way of dealing with casters' ashes was to put them in the furnace, either cupola or blast-furnace in the raw state. In that case the coke contained in them would serve as fuel to assist in the smelting. Tin dross, tin oxide, a mixture of lead and tin oxides, and minute particles of tin from tinning operations might be run down in a crucible, with a suitable flux, with good results. It was desirable in such a case to use an old casting pot that had already done duty in the furnace, owing to the destructive action of the flux.

Mr. R. M. Sheppard thought it would be extravagant to deal with the ashes in the manner suggested by the last speaker, for they would thereby lose all the spelter.

Professor T. Turner said it was highly important that the waste materials should be separately collected and carefully classified, because the percentage loss in treating a low-grade material was greater than when a rich material was treated, and the cost of treatment was also proportionately higher.

Mr. Spittle, in replying to the discussion, said it would be very bad practice to feed the ashes into the furnace as suggested by Mr. Johnstone. Besides the loss referred to by Mr. Sheppard, there was a danger of choking the furnace to be treated properly they must be thoroughly washed in an elaborate plant and the material collected step by step until they came to the most minute finings. In such a process no fuel was required, the water cost was low, the grinding cost low, and they recovered all the metal.

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In melting yellow brass screw rod chips for making brass ingot, the loss in melting can be kept down to about 5%. This is as low as it is possible to keep the melt loss, and good practice is necessary in order to do it.

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Iron may be introduced into metals by the use of a flux of yellow prussiate of potassium. It is placed on top of the molten metal and stirred in. The iron is reduced to the metallic condition and enters the metal. Copper, silver, gold, and apparently all the high melting metals take up iron when treated in this manner.

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The great advantage of a bright silver solution containing bi-sulphide of carbon, is the fact that the silver can be deposited about three times as fast as with the ordinary silver bath producing a dead deposit. This means that three times as much work may be obtained from a tank per day.

## Blowholes in Valve Castings.

A valve manufacturer recently had considerable difficulty in making sound valve castings and the difficulty he experienced was caused by the presence of blowholes. In Fig. 2 is shown a section of a casting in which the blowholes existed. The existence of blowholes in valve or other castings is a very common occurrence, but this manufacturer believed that they were caused by a certain ingot metal he had been using and a section of which is illustrated in Fig. 1.

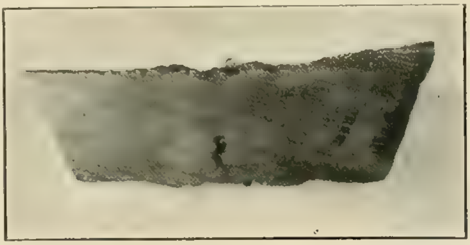

Fig. 1. Cross-Section of the Ingot Showing the Blowhole.

Troubled by the blowholes, the ingot from which the castings were made, was considered as the cause of the trouble and one of them cut in half. A blowhole was discovered in the ingot as may be appreciated from inspection of the illustration of Fig. 1. Having made this discovery, it was believed that the ingot metal was the cause of the difficulty and that gas existed in it which likewise produced the blowholes in the casting.

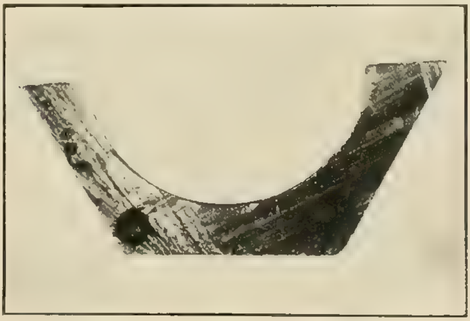

Fig. 2. Section of Valve Casting with Blowholes.

As a matter of fact, the blowhole in the ingot metal was probably caused by air as it was near the bottom of the neck separating the two heels. When the metal was poured into the ingot mold, the air became entangled and remains there. This blowhole was large and of a kind often found when an ingot has been poured at a rather low heat. Even though it might have been gas of a different nature from air, it would have no bearing upon the blowholes in the casting for the reason that it would escape when the ingot metal is melted.

Blowholes in sand castings almost entirely come from the gases generated by the combustion of the fuel during the melting and becoming absorbed during the melting. As the metal cools in the mold, these gases are expelled forming blowholes. Blowholes and pinholes are the same and are produced by gas absorption. One is simply larger than the other.

The reason why, with the same manner of melting and the same metal, blowholes will be present in one casting and not in another is in the method of melting. All fuels used in the brass foundry at the present time contain sulphur and, of course, various gases such as carbon monoxide, hydrogen, carbon dioxide are generated by the combustion of the fuel. It is the sulphur that is a very common cause of the trouble, although the other gases play an important part. When the metal melts, it absorbs these gases and then, after it has been cast in the sand mold, they are expelled and blowholes form.

In melting, therefore, the metal should be protected against these gases. A common and excellent method is to keep the surface of the metal covered with charcoal. Charcoal contains no sulphur at all and, for this reason, it introduces none into the metal. At the same time, it forms a covering which burns and has a reducing action and thus prevents the formation of oxide. It has been found that many cases in which foundrymen have had trouble with blowholes in their castings, have been caused by failure to use any charcoal at all for covering the metal during the melting. In the best regulated establishments and those which turn out the best metal, charcoal is extensively employed and is introduced into the crucible as soon as the metal melts. A better plan, and one carried out in many brass casting plants is to put some into the crucible when the metal is introduced. In this manner, the metal is protected as soon as it begins to melt. Coal or coke will not answer in place of the charcoal as it contains sulphur.

There is another feature in melting that causes blowholes in the metal and that is overheating. The hotter the metal the more readily will the gases be absorbed. It will not suffice to overheat the metal and then cool it down with scrap. The gases have been absorbed during the melting and are there to do the harm. The right procedure is to bring the metal up to the right melting point which is necessary for pouring the castings, but not allow it to go beyond it.

In addition the feature of allowing the metal to "soak" in the fire is detrimental to it. It is a very common thing to have metal ready long before the mold is finished. Then, as it cannot be poured, the metal must remain in the fire until the mold is ready and it then has a longer opportunity to absorb sulphur and gases. Should the metal happen to become overheated during this "soaking," as it frequently does, then there is all the more chance for gas and sulphur absorption and the castings will contain more blowholes.

In melting the following rules should be strictly obeyed. It makes no difference whether the metal is yellow brass, composition, or steam-metal, the procedure is the same as the same principle applies.

1. Add a little charcoal to the crucible before melting so that as soon as the metal begins to melt and run down to the bottom it will be protected by it.

2. As soon as the melting begins add a little more charcoal so that there is always a depth of half or three-quarters of an inch on the surface of the molten metal.

3. Never allow the charcoal to burn off from the top of the metal, but add more if required.

4. Do not overheat the metal beyond the actual pouring temperature.

5. Do not allow the metal to remain in the fire after it has melted, but have the molds ready for pouring before it is melted.

If these directions are followed, blowholes will not bother a brass founder as he will then rarely have them.

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Sulphur, when present in brass, is never removed during the melting, but always remains

## The Rusting of Nickel Plated Steel Buckles.

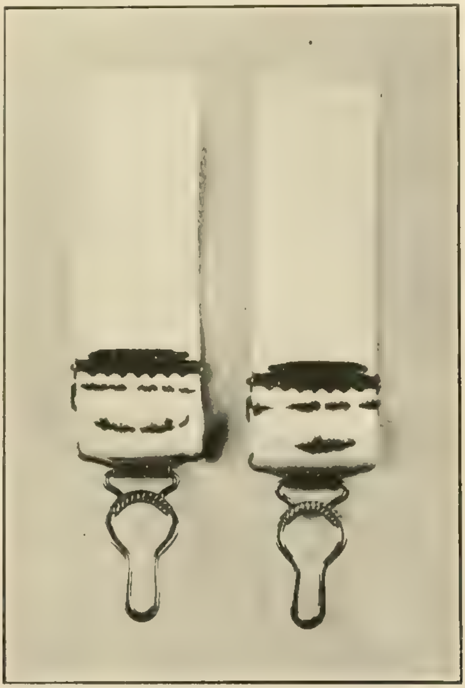
Enormous quantities of nickel plated steel buckles are now used in the manufacture of cheap suspenders and supporters. The best grades of goods are supplied with nickel plated brass buckles or trimmings, and the cheap goods have the nickel plated steel on them.

It is not infrequent that such nickel plated steel goods give much trouble on account of rusting when on the finished goods and the fault is usually laid at the door of the nickel plater for doing such a poor job of plating The fact is, however, that it is not the fault of the plater but of conditions which have to be met in the manufacure of the nickel plated goods.

The cheapness of such nickel plated goods renders it imperative that the plating be done in quantities and the plating barrel is employed almost exclusively for the purpose. Were any manufacturer to string the buckles or plate them on racks, he would not be able to compete on account of the excessive cost of the work. In barrel plating, the work is constantly tumbled and upon cheap work the length of time for plating is none too long. Again, in barrel work the amount of nickel deposited in a given time is not as heavy as in still work. Taking these things all in all, the amount of nickel deposited upon the steel goods, is inclined to be rather light and upon the points and edges of the buckles the nickel seems to be still lighter, probably on account of the tumbling they receive during the plating. This has a tendency to remove the nickel and expose the points. Whether this is actually the case, it is not quite certain, but the rusting seems to start from these points perhaps because they are the ones which come into more intimate contact with the fabric.

The rusting of the nickel plated steel buckles takes place upon the portions which come in contact with the fabric upon which they are used and in the illustration is shown the manner in which it occurs. As far as can be ascertained, every manufacturer has this difficulty and so far it seems to be impossible to avoid it. The statement is frequently made that the buckles have rusted in some instances, but not in others. In the case of the buckles herewith shown, the rusting took place, while in another instance, with the same buckles, plated at the same time, it did not. Investigation proved that the goods which rusted had been stored for several months in a damp place and during the summer months Brass buckles that had been nickel plated did not rust under the same conditions.

It is believed that it is impossible to prevent such nickel plated steel buckles from rusting, if not kept dry and in some establishments great care is taken to preserve the goods under such conditions. Even the buckle manufacturers themselves have had difficulty with the buckles rusting while made or in stock and it has been found necessary to store them in a dry room. If the buckles will rust before they are put on the fabric, they certainly will after it has been done for the reason that cloth of all kinds absorbs moisture and the portions of the buckle that come in contact with it are constantly moist.



**Rusted Nickel Plated Steel Buckles, Showing Effect on the Fabric.**

Whether copper plating the buckles previous to nickeling will assist in preventing the rusting is not known, but it is believed it will. This means an extra operation, however, with its increase in cost.

If the nickel could be deposited upon the steel after it had been electrogalvanized, the rusting could probably be prevented, but so far this has not been successful although it has been done. As a commercial proposition, however, it does not seem to be successful.

The fact remains, therefore, that nickel plated steel buckles are not rust proof and that care should be taken to keep goods dry upon which they are used.

## Correspondence.

*Editor:*

### Metallic Illusions.

In order to bring about a better understanding between the users and manufacturers of metals and alloys, I venture to request the favor of the insertion of this letter. I hope it may provoke discussion and if possible help us to arrive at the truth.

Users, including the non-expert public, of metals and alloys in general do not sufficiently realise that many of their corroded metallic wares, for example copper pans and boilers, mysterious breakages of for instance chains, railway accessories, and sudden failures of condenser tubes and copper pipes, are due to two easily preventable causes described below.

In order to satisfy the demand for beauty of form or the modern craving for cheapness, many ingenious mechanical devices have been evolved by manufacturers' works staff which put upon the metallic articles while being made uneven strains or introduce in antiquated furnacing appliances deleterious compounds, which tend to and, in varying times, finally render the articles useless in the hands of the purchasers or users. Often enough dangerous to human life and property. An attempt is made to remove these strains by annealing in unevenly heated furnaces.

Why this state of things?

One must reply, "general ignorance", perhaps, "apathy"—the major cause of most human troubles.

A few manufacturers, whose products are subject to constant physical tests, are quite alive to the situation. It must also be conceded that manufacturers of ferrous and nonferrous metals and alloys spare no pains to free them while in the molten state from deleterious substances. They employ expensive nostra known as deoxidisers—ingenious devices to prevent contact of the liquid metal with the air during the casting operations all tending to produce soundness in the ingots or castings, i. e. to free them from blow-holes and segregations.

No sooner is this desirable end attained than the metal or alloy is introduced into furnaces wherein hot gases containing free oxygen, sulphur and other objectionable elements are allowed to impinge upon or envelop the metal. While hot they are brought out of the furnace into the air and mechanically treated in an atmosphere containing oxygen. This operation is often repeated several times. In cases of cold working the metal is, with few exceptions, annealed between process in furnaces to which the air has access. After this heat-treatment they are withdrawn and allowed to cool, sometimes in approximately closed receptacles—oftener in the air. Not only is the surface of the metal oxidised or tarnished but during the whole time of heating and partly in cooling a solution of oxygen and other gases takes place with formation of compounds in intergranular spaces or in the body of the metal or alloy, which form centres or areas of corrosion when in use.

In the last year or two, exact investigations and experience have proved beyond doubt that both the above defects in heat-treatment are prolific causes of corrosion and the other breakdowns.

I therefore with all respect, beg leave to submit that the time has arrived for all engineers and users of metals and alloys to insist and specify that, at least, two causes of failure, of metals and alloys under the control of the makers shall be removed namely,

(a) Uneven heating appliances.

(b) Antiquated heat-treatment in chemically and physically active atmospheres.

Incidentally the public health will benefit because all the appliances on the market capable of bringing about the above results are smokeless when in operation. The present unnecessary and wicked waste of one of our natural resources, viz, coal, will also be curtailed.

*I am, Sir,*

*Yours faithfully,*

*T. VAUGHAN HUGHES, A. R. S. M.*

*Birmingham, December 1912*

# The Electrodeposition of Platinum.

The present extensive use of platinum in jewelry has given rise to a demand for platinum plating. This demand has also been in existence in other lines in which platinum is employed, and it is believed that many useful and economical goods can be made by its service.

Platinum plating is not a difficult operation, particularly if carried out on a small scale, as it usually is. The solution must be used hot which is, of course, an objection to large installations but is not in the case of small ones. The solution employed is an acid one and for this reason must be used in a porcelain or glass vessel. This feature, too, is not objectionable as gold is deposited every day under the same conditions.

There are a number of solutions for the electrodeposition of platinum, but the best is that first proposed by Roseleur, the celebrated electrometallurgist of Paris. This solution has been found to give excellent results and is not difficult to work or to make up. With a little chemical knowledge and experience in electroplating, an operator will have no difficulty, but will be able to turn out a good job of plating right along.

This solution has the advantage over the others proposed (whether they are in commercial use or not cannot be ascertained) in that the platinum has no tendency to separate out as the bath is standing idle. In the other solution, this is an objection and the platinum has a tendency to separate spontaneously and thus in time render the solution useless.

The solution about to be given and which was first used by Roseleur, has been slightly modified. Phosphate of ammonia as recommended by him as one of the ingredients has been left out, as it is difficult to obtain. The same result, however, is obtained by the use of phosphoric acid and then adding ammonia.

To make the platinum solution for the electrodeposition of platinum, proceed as follows:

Take 1 oz. of platinum (or 30 grams) and dissolve in aqua-regia made of 15 oz. (450 c. c.) of pure, strong muriatic acid and 10 oz. (or 300 c. c.) of pure, strong nitric acid. The amounts are fluid ounces. The platinum should be as pure as possible and free from iridium as the latter metal not only causes the platinum to dissolve with great difficulty, but the iridium chloride interferes. The pure platinum chloride may be purchased and the amount made from 1 oz. of platinum or that containing 1 oz. of platinum should be used.

The platinum is placed in a porcelain dish and heated gently with the aqua-regia until it is dissolved. When this is done, heat the dish gently for some time until the platinum chloride that has now been produced becomes thick and syrupy. The object of this evaporation is to remove the excess of acid, but the platinum chloride should not be evaporated until dry as it is then partially destroyed. When it is thick and syrupy, the right condition has been obtained. There is now obtained pure platinum chloride, free from an excess of acid.

When cool, dissolve this platinum chloride in 3 quarts of water (or 3 liters) and to it, add 15 oz. (fluid) of a 50% phosphoric acid (or 450 c. c.). Next add ammonia until the solution smells rather strongly of it when a yellow precipitate of the double phosphate of platinum and ammonia will be thrown down. This precipitate should *not* be filtered out, but is allowed to remain in the solution.

Now dissolve 50 oz. (or 1500 grams) of sodium phosphate in 3 quarts of hot water (or 3 liters). Now pour it with constant stirring into the platinum solution containing the ammonia. The mixture is now boiled for a short time until no more smell of ammonia is given and the solution which was previously alkaline, turns blue litmus paper red. The ammonium phosphate in the solution is decomposed on boiling and ammonia is given off and the solution, previously alkaline, now becomes slightly acid. The yellow liquid also becomes nearly colorless as this reaction takes place. The solution is now ready for use. The amount should be about 1½ gallons or about 6 liters. If desired, the amounts can, of course, be reduced in order to make a less quantity. It will be seen that the solution is rather rich in platinum, but this is necessary in order to obtain good results.

The solution when used for platinum plating should be heated to about 150-180 degrees F. The hotter it is, the better it seems to work. A cold solution will not work.

As an anode a piece of platinum is preferable although not entirely necessary. Carbon may be used if desired. If a platinum anode is used, however, there is no action on it and the solution cannot be fed from it. To replenish the solution, fresh platinum chloride must be introduced. The platinum anode is never attacked and may be used indefinitely without injury.

A high current density is necessary and the voltage should be maintained at 5 or 6. At a less voltage the electrodeposition does not take place.

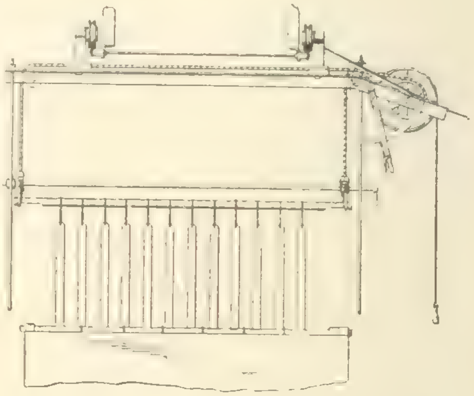
The platinum cannot be deposited upon iron or steel direct, but they will have to be coppered, nickeled or silvered before it is done when no difficulty will be experienced. The electrodeposition on brass, copper, silver, nickel bronze or gold takes place readily. It is useless to coat the articles with a slight film of mercury in a "quick-dip" as this seems to do no good. The deposit is put on the metal direct, but it is needless to say that extra care should be taken to produce a clean surface before the electrodeposition of the platinum.

The deposit forms immediately and in a few seconds a bright deposit is obtained if the metal underneath is highly buffed. The platinum deposit takes the nature of the metal underneath and upon highly buffed surfaces, the deposit of platinum will be quite bright. Heavier deposits are more or less dead, like those of other metals, and require buffing to produce a bright and polished surface. A minute is usually a sufficiently heavy deposit for most purposes, and for a bright, flash deposit a few seconds suffice. Heavy deposits of almost any reasonable thickness may apparently be produced by long deposition. The deposit seems to come dense under such circumstances.

The deposit of platinum is quite hard and of the regular platinum color. It is so hard that it cannot be scratch-brushed by a brass scratch-brush, but one of steel must be used. Even then, it seems to remove particles of steel, but these can be taken from the surface by muriatic acid (equal parts of acid and water). The platinum deposit cannot be burnished as it is too hard. It must be buffed and the same compositions used for hard nickel employed. Vienna-lime is good for this purpose. The best results, however, seem to be obtained by highly buffing the base metal and then depositing the platinum upon it as a light coating. It will then be sufficiently bright and will not need buffing.

## A New Mechanical Plating Apparatus.

One of the marked improvements in electroplating during the past ten years, has been the increase in the various forms of apparatus for reducing the labor used in carrying out the process. Plating barrels are now very successfully used for electroplating small articles, but for large articles they cannot be employed. Some years ago an apparatus made its appearance on the market, and is now in use in a number of establishments where large articles are treated. It consists of an appliance which automatically lifts the work being plated from one tank to another. The objection to this apparatus is its cost. Otherwise it has been found satisfactory, especially for large work.



**Mechanical Plating Apparatus for Heavy Work.**

A simple and inexpensive form of apparatus somewhat similar to that previously mentioned has been invented by John A. Fraser of Benton Harbor, Mich. He has been granted a patent upon it. The appliance consists of a device for lifting a large amount of work out of the plating tank, carrying it along and dropping it down into the next tank. To render this possible, the cathode rod is made of special form so that it can be easily removed from the connections; and also, may readily be replaced upon them in the next tank. In transferring the work from one tank to another, such as from a copper plating solution to a nickel tank, the whole cathode rod with the work on it is lifted out of the tank by the apparatus, carried along a track and then dropped into the second tank.

## Brittle Scrap Copper Wire.

Large quantities of scrap copper wire are consumed in the brass foundry trade and when not too small, is excellent material, provided, of course, that the wire is in "crucible shape". Copper wire is frequently better than some brands of ingot copper for brass founders use and this statement applies particularly to the so-called casting bands which are usually quite impure. All copper wire is put on the market of high conductivity and unless it comes up to a standard of purity, approximately 98% Matthiessens standard, it is rejected. There is no better test of purity for copper than the electrical conductivity and, for this reason, if the wire has a high conductivity, it must be pure. Therefore, copper wire in the form of scrap is always good.

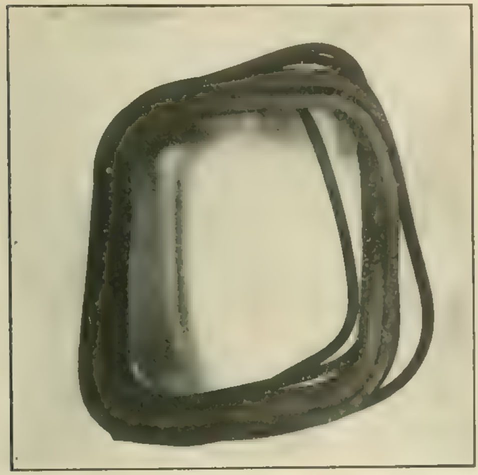


**Fig. 1. Scrap Copper Field-Coil Wire. This Was Brittle on Account of Sulphur in Insulation.**

Wire that is too fine is not good for brass foundry purposes as there is so much surface exposed during the melting that it is considerably oxidized. Trolley wire, heavy field coils and other large sizes of wire, are always good, but should be made into compact masses which will fill the crucible without protruding at the top.

There is a large amount of scrap copper wire on the market that has been obtained from that which has been insulated. Insulated copper wire is of two kinds:

1. Textile insulation, generally of cotton and saturated with waxes or similar waterproofing materials.
2. Rubber covered wire.

The cotton insulation contains no sulphur, and when burned from the wire, leaves nothing behind or affects the wire in any way. Copper wire, from which this insulation has been burned, is as good as new copper.

Rubber covered wire is used to a large extent at the present time for wire carrying high tension currents. This wire, after the insulation has been burnt off, has the same appearance as that from which the other kind of insulation has been removed, but it frequently is of poor grade on account of the absorption of sulphur during the burning-off of the insulation.

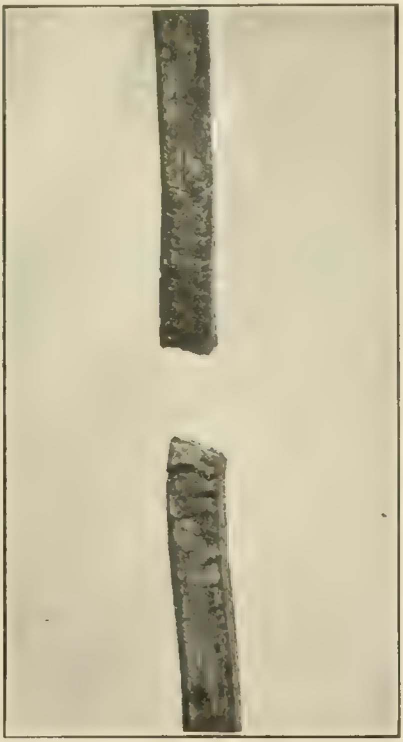


**Fig. 2. Showing Brittle Nature of the Wire.**

The common method of burning off the insulated covering of copper wire is to place it in a pile and start it by means of gasoline or kerosene oil. The heat generated will cause the mass to burn until all the insulation has been consumed.

### *Effect of Sulphur in the Insulation*

Copper wire, from which the rubber insulation has been burned off, is frequently brittle, and this brittleness is caused by sulphur. All rubber contains sulphur, used in its vulcanizing, the copper absorbs it when red hot, particularly if heated nearly to its melting point when the insulation is burned off. It is not infrequent to find that copper wire which had been insulated with rubber, becomes quite brittle when this insulation is burned off. This is particularly true of fine copper wire as it becomes quite hot in the fire and often actually melts. In the case of the heavier sizes of wire, the heat is not as great, but even then, some sulphur is absorbed.

It often is found that wire, from which rubber insulation has been burned off, will have a good appearance, but when bent slightly will break or show cracks. In Fig. 1 is shown a coil of copper wire from which rubber insulation had been burned off. Although brittle, this wire did not show it until bent when it either broke or small cracks started in the sides. In Fig. 2 is shown a section of a piece of the broken wire. The brittle nature is quite noticeable and was caused by the sulphur absorption from the insulation.

The sulphur in the scrap copper wire may or may not seriously affect its quality, depending upon the amount present. Sulphur in the copper produces dirty metal, when made into brass or composition, and also makes blowholes in the castings. If the wire is brittle it shows that it contains sufficient sulphur to cause trouble and is to be avoided. Wire that is not brittle is all right and need not be feared.

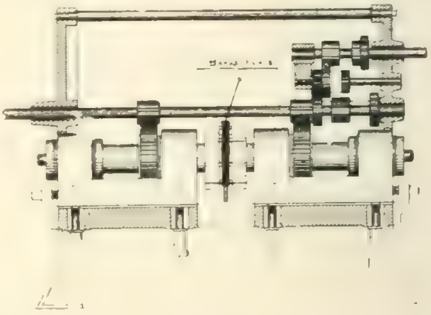
A brass founder, therefore, may easily ascertain the character of the wire by its appearance. If it is brittle, it should not be used, but if tough it is as good as ingot copper, as far as purity is concerned, and often better than many of these so-called casting brands.

The elastic limit of the bronzes is not sharply defined and in many of them, notably the aluminum-bronzes, it is difficult to ascertain where it actually lies.

All the alloys of manganese and copper will roll hot and may be made into sheet or drawn into wire, provided, of course, that the mixture is not without ductility when cold. Even the very hard mixtures will roll hot. The limit of successful rolling, however, seems to lie at about 30% manganese.

## A Modified Method of Over-Hauling Brass for Rolling.

When brass is cast in metal molds for rolling into sheet, the surface is not clean, but contains more or less oxide (dross) and particles of carbon from the oil used on the mold. In order to remove these foreign materials an operation called overhauling or scraping is carried out (also frequently called scalping). At one time this was done with the hand scraper, but later the Stever machine, in which the scraper was worked with a machine, was employed. Improved and heavier machines, but upon the same principle, are now used. The surface of the brass is scraped or cut off.



New Form of Machine for Overhauling Brass.

A modification of the overhauling machine has recently been patented by James M. Chatfield and Karl W. Hallden of the Plume & Atwood Mfg. Co. of Thomaston, Conn. This machine employs a different principle from that of the regular overhauling appliance of the brass rolling mill. Two rotary milling cutters are used and which revolve downward so that the chips cut from the brass are thrown under the machine and do not clog the mechanism. The brass plate to be overhauled is fed between rollers which carry it to the milling cutters and both sides of the plate are cleaned at the same time.

The regular overhauling machine treats but one side of the plate at a time, when the other side is turned upwards and overhauled separately. In the machine herewith illustrated, the plate is overhauled in a rapid manner without any skilled labor being required.

# Frequent Failure of the Muriatic Acid Dip for Removing Stains from Brass and Copper Surfaces Previous to Plating.

The muriatic acid dip is extensively used by platers for removing the stains produced in cleaning brass and copper work previous to plating, but there are instances in which it fails to work and, it is believed, this fact is not generally appreciated. When it works, the dip is quite satisfactory and cheap, and is free from the objectionable odor of the cyanide dip employed for the same purpose.

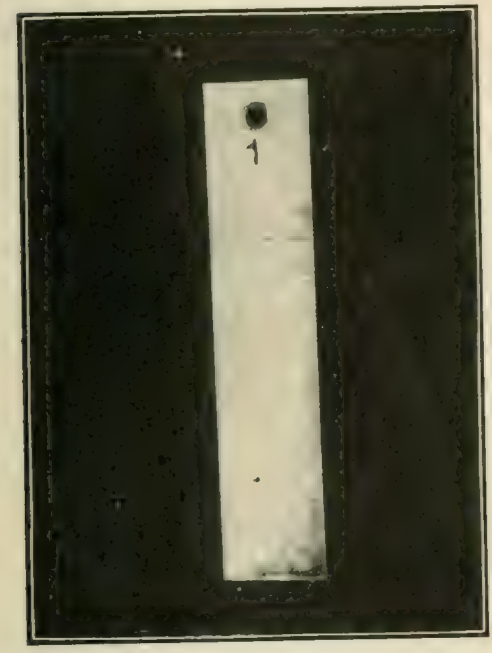


Fig. 1. Stained Brass Before Using Cyanide Dip.

When polished brass or copper work is cleaned from grease in potash, soda or other cleaning materials, there is invariably a slight stain left on the work. This stain may be greater or less, depending upon the length of time the articles are in the cleaning kettle, or the strength of the solution or the purity of the cleaning substance. Ordinarily, when the work is pretty free from grease and a momentary immersion in the kettle is all that is required for cleaning it, the stain is almost imperceptible, but it is actually present, and it is always advisable to immerse the articles, after they come from the cleaning kettle in muriatic acid or a cyanide dip to remove it. When it is done, the surface is left perfectly clean, and without it, it is not and the plating may not hold as tenaciously as it otherwise would.

The immersion of the stained articles, after they come from the cleaning kettle, in a muriatic acid dip or that made from cyanide, immediately dissolves the stained surface and leaves the absolutely clean metal underneath. To be sure, many good jobs of plating are done without the use of either of these dips, but the reason is that the articles after they come from the cleaning kettle and have been rinsed off in water, are transferred to a plating solution containing cyanide (such as, for example the ordinary copper or brass solution) and such a solution really acts as a cleaning dip itself. In the case of nickel or an acid copper solution, however, this action will not take place and the use of the muriatic acid or cyanide dip previous to plating should never be omitted

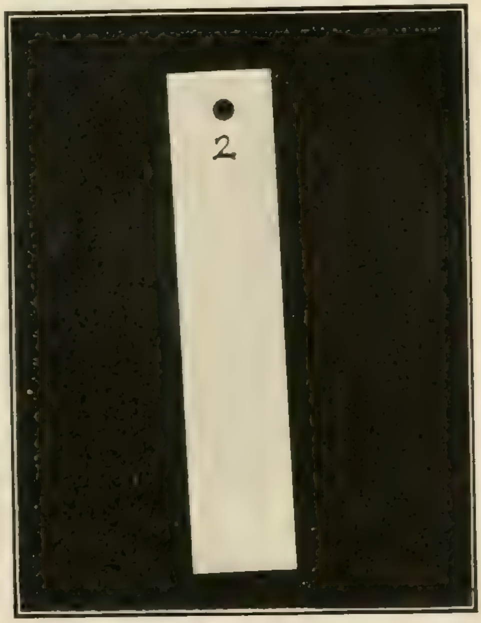


Fig. 2. Stained Brass After the Cyanide Dip. The Muriatic Acid Dip Failed to Remove the Stain.

### *Case in Which Muriatic Dip Works*

When brass or copper work is cleaned in alkalies, as previously mentioned, staining always takes place to a greater or less extent, and the cause of it is the formation of a film of oxide on the surface. In the ordinary process of cleaning, this is very slight but usually perceptible. By immersion in a dilute muriatic acid dip, this oxide film is dissolved and the clean metal left. The oxide is soluble in even dilute muriatic acid and it is unnecessary to employ the strong acid. The following proportions are good and even with this degree of dilution, the oxide film or stain is immediately dissolved, provided, of course, that it will dissolve at all which, as will subsequently be explained, may not take place under certain conditions. The strength of acid which can be used is:

| | |
|---|---|
| Water ............ | 4 gallons |
| Muriatic Acid ........ | 1 gallon |

This strength of acid seems to work as well as that which is stronger and there is no danger of the surface of the metal being attacked. The dip is used cold and the work to be cleaned is simply immersed in it momentarily and then rinsed off in cold water.

### *Instance of Failure of Muriatic Dip*

When the surface of the brass or copper articles to be plated is stained by sulphides, muriatic acid will not remove it for the reason that sulphide of copper is insoluble in this acid. This fact, it is believed, is not generally appreciated by platers and there are instances in which the muriatic acid dip utterly fails on this account. The potash, soda or other cleaning material may contain a slight amount of sulphur compound which causes the formation of sulphide of copper on the surface of the brass or copper being cleaned. Again, the article may remain in the air after cleaning and sulphurous fumes from various sources may stain the surface. In these instances it will be found that the muriatic dip will absolutely fail to remove the stain.

The following experiment is easily tried and will demonstrate, without question, the impossibility of using the muriatic acid dip under all conditions:

### *Experiment*

Make a very strong solution of caustic soda or caustic potash in water by dissolving 5 lbs. of either in 1 gallon of water, or, if a smaller quantity is desired, use about 1 lb. in a quart. In other words, make a very strong solution. Now heat to boiling and immerse a piece of polished brass work in it. Leave it in the solution until it begins to stain and then remove, rinse in water and immerse in the muriatic acid dip. The stain will immediately be removed.

Now add a small piece of liver of sulphur to the potash or soda solution about the size of a pea, or just enough to cause the formation of sulphide on the surface of the brass. Immerse the brass in the solution again until stained and then try to remove this stain with the muriatic acid dip. It will be found impossible and the acid will not attack it. Immerse it in a cyanide dip and the stain will instantly be removed.

The reason, of course, is the fact that the sulphide of copper formed is insoluble in muriatic acid but is in the cyanide. In Fig. 1 is shown a piece of polished brass work which was stained by a slight amount of sulphur in the cleaning solution, but when immersed in the muriatic acid, even though strong or the straight, undiluted muriatic acid was employed, the removal failed to take place. 'When immersed in a cyanide dip, however, this stain was at once dissolved and the clean metal shown in Fig. 2 resulted.

The lessons from this article are that the muriatic acid dip cannot always be used in place of the cyanide dip for the removal of stain from brass or copper work, and it is believed that its value is greatly over-rated. The cyanide dip, however, can be used in all cases. Those who are able to use the muriatic acid dip without trouble need not employ the cyanide dip, but investigations have shown that there are many instances where muriatic acid was used for removal of the stain left after cleaning in which failure resulted, and resort had to be made to the cyanide dip. The cause was the presence of sulphur compounds either in the cleaning solution or in the air which caused the formation of a sulphide on the surface of the cleaned metal and which the muriatic acid failed to remove.

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Unless the arsenic finishes are lacquered, they soon oxidize and fade out. The reason for it is the fact that arsenic, which is present in the metallic condition on the metal, easily oxidizes to the white or arsenious oxide.

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A hot sulphuric acid pickle is very efficacious in removing hard scale from brass, bronze or German-silver. It will remove it rapidly when a cold pickle apparently has little effect on it. The same proportions of acid and water are used that are employed for cold pickling, but the temperature should be at least 150° F. to obtain the full value of hot pickling.

## Edison's Method of Separating Copper from Nickel.

The following method has recently been patented by Thomas A. Edison for separating metallic copper from nickel. In the manufacture of his storage battery flakes of nickel coated with copper are produced and it is necessary to dissolve off the copper and leave the nickel in the metallic condition.

The composite electrodeposit of the copper and nickel, made by depositing nickel on a thin film of electrodeposited copper, is treated the nickel in the metallic condition.

Water ................ 1 gallon
Copper Sulphate ........ 1½ lbs.
Cupric Chloride ...... 1¼ oz.

The solution is used hot and air is blown into it while being used in order to oxidize the cuprous salt which forms. Basic sulphate of copper is formed by the reaction and the nickel flakes remain undissolved. The nickel flakes are removed and the basic sulphate of copper filtered out, treated with sulphuric acid and made into normal sulphate of copper for use again.

Ferric chloride may also be used instead of cupric chloride, but it is stated that the results are not as good. Another solution is one of ammonium sulphate and cupric chloride and this has also been patented by the aforesaid inventor.

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The principal impurities in commercial aluminum are silicon and iron and it is a very difficult and costly operaton to produce the metal free from them.

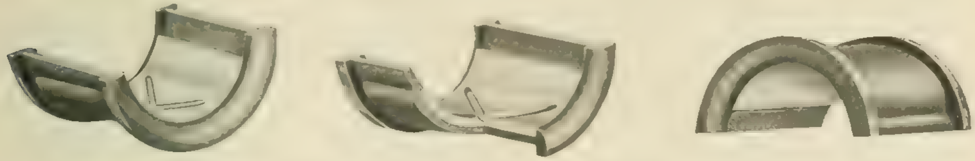
---

Brass wood screws are made without any lead in the brass mixture for the reason that it would prevent the head being formed by "upsetting" as it now is upon the machines used for making these screws. Brass machine screws, however, are made from leaded brass for the reason that they are entirely turned out and an easy cutting metal is necessary.

## A New and Novel Method of Making Babbitt-Lined Bronze Bearings.

For certain purposes a babbitt-lined bronze bearing is superior to anything else and both the advantage of the strong bronze and the antifrictional qualities of the babbitt are then obtained. The usual method of lining a bronze shell with babbitt-metal is either to pour it in while heated, after tinning the bronze to make the babbitt adhere, or solder it in.

The Doehler Die Casting Co., Court and Ninth Sts., Brooklyn, N. Y., have recently brought out a process of making a babbitt-lined bronze bearing which is both new and novel. The following is their method of producing it



Bearings Illustrating the Manner of Constructing of Bronze and Babbitt.

This company recently brought out a new process for making brass parts by pressing brass while hot into the desired shape. A mixture is used which is plastic while hot, but hard when cold. In this manner the bronze part is made, by taking the heated mixture and forcing it, by means of hydraulic pressure, into a steel mold. A hard, accurate shape is then produced ready for lining.

The lining of the shell with babbitt is the novel part of the process. A rolled, sheet babbitt metal of high grade is used and this is cut into strips which will fit into the recess of the bronze sheet. Hydraulic pressure is then applied and the babbitt metal is forced into the recess so that it is very securely locked into position. The recess is made dovetailed, as may be seen in the illustration, so that when the shaft revolves in it in either direction, the babbitt cannot come out.

The bronze shell, having been forced into an accurate steel die, needs no machining whatever, and the babbitt shell is likewise accurate on account of the die used to press it into the recess. The finished or completed bearing, therefore, is ready for use and no machining whatever is done upon it. It is used like a die cast bearing (which it really is) and slipped into place without machining or scraping.

Bearings of a similar construction have been used for automobile work in France and Italy for the past ten years with excellent results and after this length of service have been found nearly as good as new. The bronze, of course, stands a strain that a die casting will not, and in addition, the antifrictional qualities of the babbitt with its abilty to adapt itself to the shaft are both obtained.

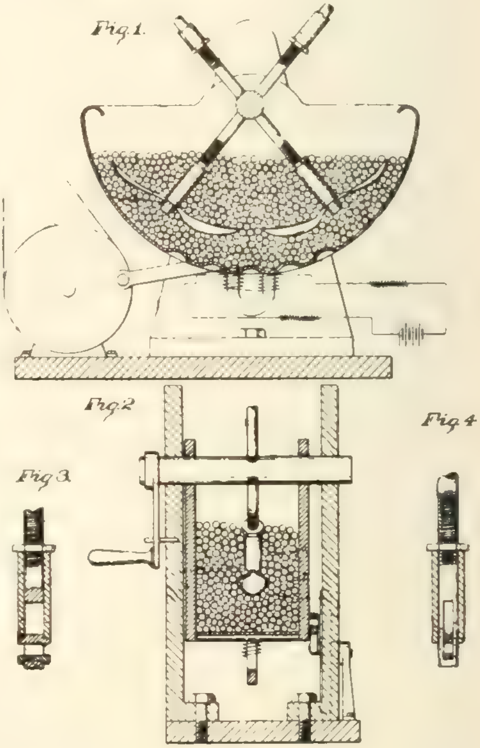
## Burnishing Silver Plated Spoons by Means of Steel Balls.

Spoons and other forms of flat ware have always been burnished by means of a hard steel burnisher. The greater portion of the flat-ware made is burnished by a machine, but the principle is the same as that employed in hand burnishing. The hard, steel tool is forced over the surface of the silver deposit with considerable pressure and the burnisher is lubricated by a soap solution to make it slip, so to speak, and prevent the silver from being torn. The action is simply one of forcing down the soft silver to a smooth surface; but at the same time, it is hardened and in a better condition to resist wear. It is for this reason that burnishing is preferable to buffing as the buff removes some of the silver, while the burnisher does not. A buff does not harden the silver at all.

A method for burnishing flat-ware by means of steel balls has recently been patented by Charles H. Hart of Hartford, Conn. and George B. Stretch of Meriden, Conn. The steel balls are placed in a hopper connected with an arm operated by power. This arm is used to rock the hopper and cause the balls to pass over the surface of the spoons or other forms of flat-ware treated.

The spoons are held by clamps as shown in the illustration and these clamps are connected to movable arms which can be turned by means of a crank (shown in Fig. 2) so as to remove the flat-ware after it has been finished. In Figs. 3 and 4 are shown the detailed mechanism of the clamps.

The hopper or receptacle, in which the balls and the flat-ware are placed, is made with overturned lips so that during the oscillation or rocking for moving the steel balls over the surface of the flat-ware, none will roll out. This feature may also be obtained by making the hopper higher, but the overturned lip obviates the necessity for a large receptacle. The bottom of the hopper is corrugated so that as the balls move they are given an upward motion and press against the surface of the flat-ware.



Burnishing Silver Plated Spoons by Means of Steel Balls.

A very novel feature of the invention lies in the use of an electromagnet underneath the hopper. This magnet attracts the steel balls and puts a pressure upon them so that, as they rub over the surface of the silver, a condition similar to that of ordinary burnishing is obtained. In addition to this, it produces a pressure on the balls passing over the top of the flat-ware. Both sides of the spoon or other article, therefore, are burnished at once and the edges are likewise treated at the same time.

## Use of Plastic Alloys for Improving the Conductivity of Electric Wire Joints.

Electric currents used for electroplating are always of the low voltage type and, for this reason, it is necessary to have good connections between the wire, rods or cables used for connecting. Low voltage currents have no property of "jumping" an imperfect joint and even a slight oxidation of the connection will effectually prevent the passage of the current. In order to overcome such poor connections it is customary to solder the copper wherever possible, but there are many instances in which this is either difficult or impossible.

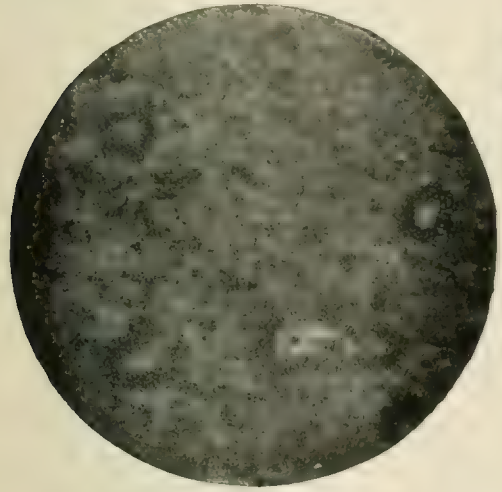


Fig. 1. Polished Surface of Rolled Copper Plate, Magnified 50 Diameters.

The Munning-Loeb Company of Matawan, N. J., manufacturers of electroplating supplies and equipment, have recently placed on the market a material which they call "Optimus" plastic-alloy and is intended for making a perfect connection between copper electrical conductors. This plastic alloy is, in reality a metallic putty and which can be applied to a joint easily. It unites with the copper and actually solders the connection together. without the use of heat.

It is usually supposed that copper surfaces are smooth and regular and that when brought into contact, a perfect connection is produced. This, however, is not so, as may be appreciated from an inspection of Fig. 1 in which the surface of copper is shown. This surface was polished and then magnified. The unevenness of the surface, ,with its peaks and valleys may readily be seen. Fig. 2 shows the polished surface of a copper plug used under heavy pressure in a cylindrical hole in a steel rail. The dark line shows the layer of oxide. The contact resistance of such a joint is high, even though the appearance of the surface indicates no such condition.

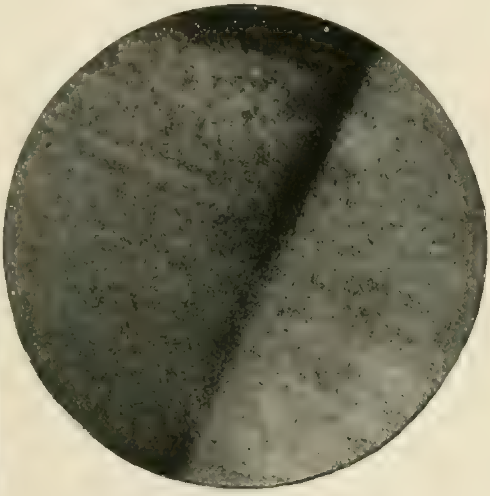


Fig. 2. Line of Contact Between Steel Rail and Copper Terminal. Magnified 50 Diameters.

The following case is cited by the aforesaid company to indicate the actual loss in money through resistance of a poor joint. The tests were made in France on joints made by the best French method:

A bus-bar, carrying 1760 amperes, lost 84.48 Watts and which means that a plant, operating 10 hours a day, 300 working days in a year, wastes 253 kilowatt hours which at 10 cents per kilowatt hour (the average cost of electric current), would cost $25.30 per year. This, however, is only one joint and the loss may be greater or less depending upon the condition of the joint.

The advantage of producing a perfect joint on copper conductors may readily be appreciated, therefore, and the "Optimus" plastic alloy would seem to be the ideal material for the purpose. The ease with which it may be applied and the increase in conductivity of the conductors when used, means that platers cannot afford to install electrical equipment without using it.

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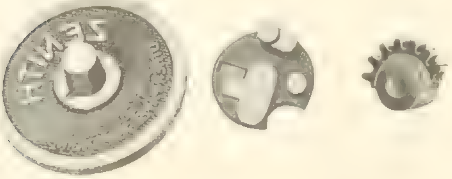
Cobalt can be deposited from its double sulphate solution in exactly the same manner as nickel.

## Molded Brass Articles for Replacing Brass Castings.

In *The Brass World*, January 1913, page 16, was described the new process recently brought out by the Doehler Die Casting Co. of Brooklyn, N. Y. for making articles of brass to replace sand castings and this process, while limited in its application, is, nevertheless adapted for many classes of work.



The process is based upon the fact that certain of the brass mixtures, while hard, when cold, become quite soft when red hot and may be easily worked. This fact has been utilized and the brass, heated to a temperature at which it is the most plastic, is pressed into a steel die, by means of hydraulic pressure. The die is made accurately so that the finished casting needs no machining or so little that it is practically in a finished condition when cast.

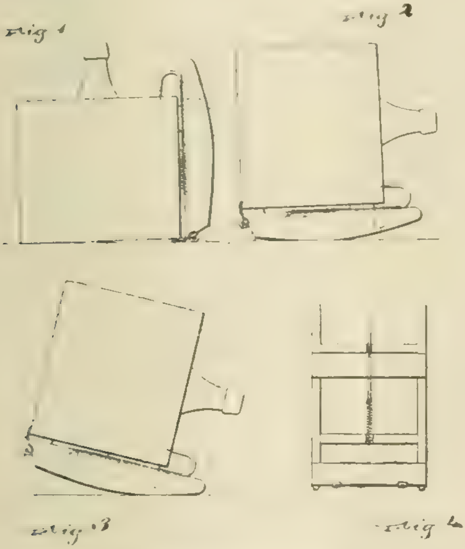
The brass mixtures that are plastic when hot are those containing from 50 to 60 per cent of copper. A favorite mixture and one used almost exclusively in the extrusion method of making brass rods and shapes, is that which contains 55% copper and 45% zinc. This mixture is hard while cold, yet tough and free from brittleness, and yet it is very soft while red hot. It is this soft condition when heated, that allows it to be forced out of the die in the extrusion process and to take an impression, as in the Doehler process, when forced into a steel die. This mixture, however, may be modified to suit the case and slight additions of tin cause a greater hardness, and less copper produces a softer metal. When much more than 60% of copper is used, however, the mixture does not work as well while heated and the best one lies near the 55% copper and 45% zinc mixture.

The process of making these articles is really one of forging, yet the casting itself has the properties of a die casting in that it requires no finishing or very little. However, the process is really a modification of die casting with the exception that the metal is forced into the mold while plastic instead of in the molten condition. Up to this time the manufacture of die castings by pouring or forcing the metal into the mold in the same manner as the soft, white metal alloys, has not been a commercial success, although it has been done in a limited way. The cracking of the brass when cooling from the molten conditions takes place and with its accompanying shrinkage, is the difficulty experienced.

In the illustrations which accompany this article, are shown an assortment of articles made of brass by pressing the plastic metal as described. It will be seen that they are of rather simple shape, but have the advantage of accuracy and freedom from blowholes, sandspots, or other imperfections usually encountered with brass castings made in sand. In many cases, machine work is necessary upon them but this is generally confined to simple and inexpensive work, such as drilling or tapping holes, slotting or otherwise treating. The shapes can be adapted for many purposes where sand castings, with their expensive machining, are employed. Many articles cannot be made at all, while others, seemingly simple, would require much expensive machine work were they to be made of sand castings.

## An Improved Carboy Rocker.

Acid carboys are always difficult to handle and a good device for tilting them has always been desired in the trade. The late S. C. Catlin, the well known inventor of the None-such plating barrel was the inventor of the apparatus herewith shown and a patent was recently granted for it. Rockhill & Vietor, 114 John St., New York City are the owners of the patent and are now placing the rocker on the market.



Improved Carboy Rocker.

The rocker, as shown in the illustration, is fastened to the carboy by a spring clamp and is so constructed that the tilting may be performed with very little manual exertion. The rocker is made of wood and is comparatively inexpensive. By its use, the handling of acids is rendered an easy task and is free from danger, caused by the spilling of the acid, that frequently accompanies the ordinary method of tipping the carboy over by hand.

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For solder, chloride of zinc is the best ordinary flux for general purposes. It should, however, be free from any excess of acid and is made by dissolving zinc in muriatic (hydrochloric) acid until there is no more action. An excess of zinc should always be used, so that when the action of the acid ceases, there is some zinc left. A neutral solution of chloride of zinc is thus obtained

## A Novel Process of Casting Gold Rings.

A novel process of casting gold rings has been patented by Fred H. Curl of Longbeach, Cal. The process is herewith illustrated. A series of patterns are placed on a plate as indicated in Fig. 1. These are of different sizes as may be required for varying size settings to accomodate small or large gems. A small molding flask is placed over the ring pattern to be used and molding sand is rammed into it. The top is then leveled off and the whole is now removed from the ring pattern. This constitutes the cope portion of the mold. The other half or nowel portion of the mold is rammed in the same manner and then removed.

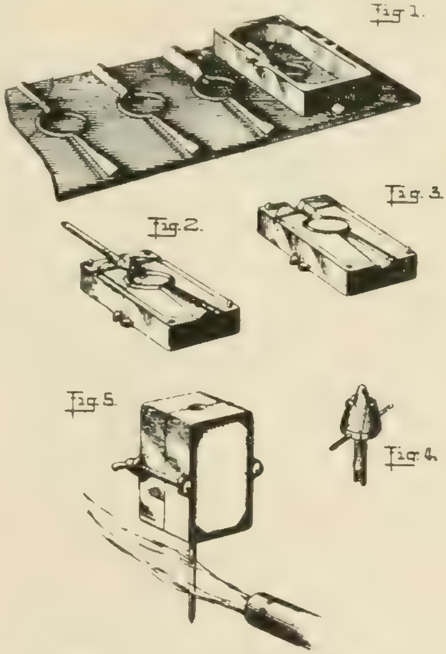
Fig 1.
Fig. 2.
Fig. 3.
Fig 5.
Fig. 4.

Improvement in Casting Gold Rings.

The two portions of the mold are shown in Figs. 2 and 3. A core shown in Fig. 4 is used to make the prongs of the setting and this may be of sand clay, metal or other material. The core having been inserted, the mold is closed and clamped together as indicated in Fig. 5. A stem fastened to the core may be used, as shown in Fig. 5, for allowing heat to be applied. This can be accomplished by means of a burner and serves to heat the core so that the gold will not chill when it strikes it during the casting.

## A New Form of Electric Speed Indicator or Tachometer.

A new form of electric speed indicator or tachometer has been placed on the market by the Brown Instrument Co. and the Keystone Electrical Instrument Co. of Philadelphia, Pa. It is intended for the purpose of accurately indicating or recording on a chart, the revolutions per minute of a rotating shaft or wheel.

There are many operations where an accurate speed indicator is desired to be permanently connected to an engine or machine, and to show at a glance the speed at which it is running; or to keep a constant record of this speed on a chart for the whole twenty-four hours. This electric speed indicator has the advantage of not only being exceedingly accurate, but the indicating or recording instrument can be located at any desired distance from the shaft, the speed of which is to be measured.

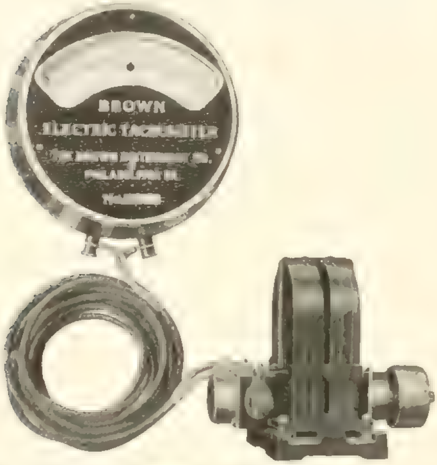

Fig. 1. Standard "Brown" Electric Speed Indicator.

The instrument consists of a small magneto or generator, particularly designed for use with this speed indicator, and which generates 25 volts at 1000 R. P. M. On account of the voltage generated, an instrument absolutely dead beat can be supplied. Instruments have been especially designed, by the aforesaid companies, of particularly high resistance, exceeding 3000 ohms in each instrument, so that the length of leads connecting the magneto or generator and the indicating instrument, have no effect on the readings; and also one, two or three instruments may be connected to the same generator without affecting the indications. This high resistance feature is exceedingly advantageous, for oftentimes after the generator and one indicating instrument have been installed, it is desirable to place a recording instrument in the office, or another convenient point, and this can be connected to the generator without recalibration of the instrument.

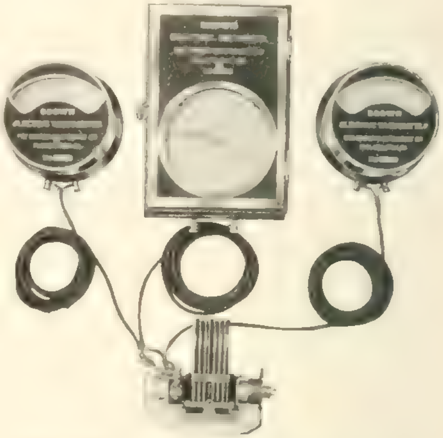

Fig. 2. Group of Instruments Connected to a Generator.

In Fig. 1 the standard "Brown" electric speed indicator or tachometer is shown with the leads and indicating instrument usually supplied, while in Fig. 2 is shown a group of instruments connected to a generator driven by a sprocket and chain, two indicating instruments and one recording instrument being connected to the same generator to both indicate and record the speed at three different points.

With many machines it is desirable to operate them at a certain speed to produce the best results as, for example, in large machine tools it is necessary to know the cutting speed, so that by the use of the elecric speed indicator, mounted beside the machine, the exact speed can be noted at all times, and maintained as desired.

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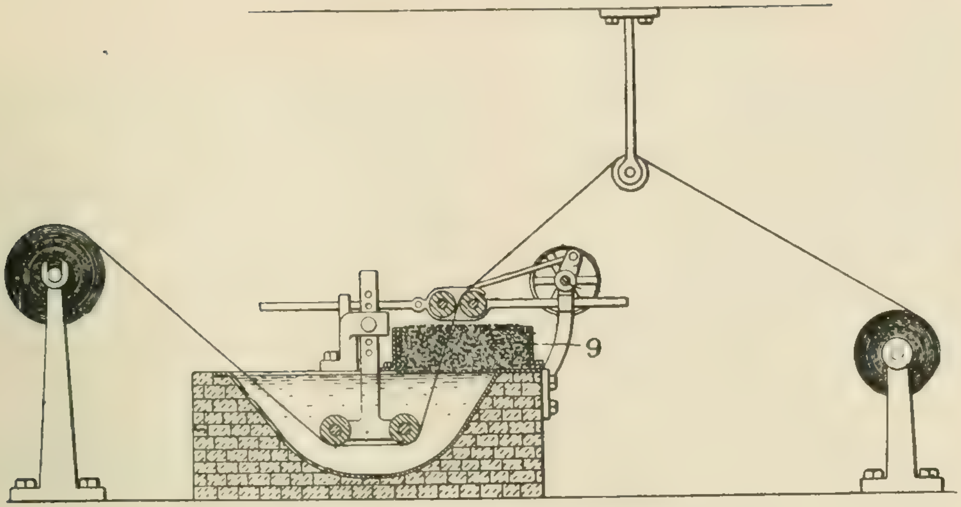
When copper is oxidized by liver of sulphur, a smutty, dead black color is the result of either leaving too long in the solution, or the use of too strong a solution. The best results are always obtained by the use of a rather weak and fresh solution of the liver of sulphur so that the color comes up gradually.



Method of Galvanizing Wire Cloth and Using Charcoal as "Wiper."

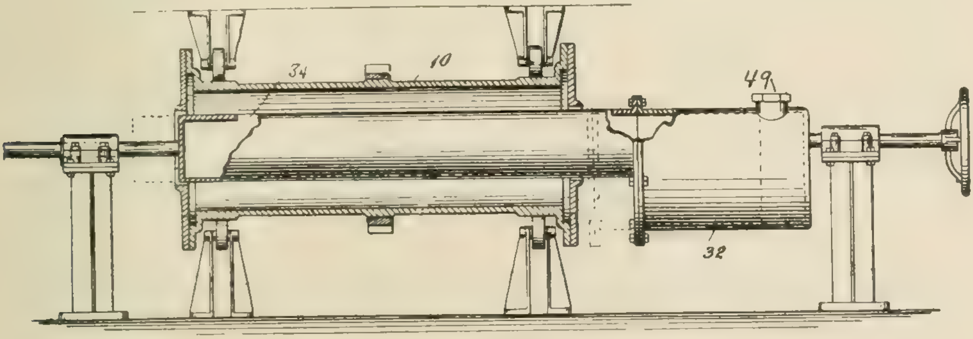
## An Improvement In Galvanizing Wire Cloth.

An improvement in galvanizing wire cloth has been patented by George M. Wright of the Wright Wire Co. of Worcester, Mass. The cloth is drawn from a reel down through the bath of molten zinc, contained in an iron kettle. At the bottom of the kettle are roller guides, as shown in the illustration. The cloth then passes through a mass of charcoal 9. At the same time a laterial motion is given the cloth by a device shown. The charcoal removes the surplus zinc from the top and sides of the wires of the cloth, but on the bottom of the meshes it fails to brush it off. By giving the cloth a lateral motion, however, this surplus zinc on the bottom of the mesh wires is scraped off.

## Casting Tube-Shells or Pipes Centrifugally.

The casting of tube-shells or pipes by means of centrifugal motion has always been a difficult operation. In a patent recently granted to W. H. Millspaugh of Sandusky, Ohio (U. S. Patent, 1,047,972, Dec. 24, 1912) the process seems to have been somewhat simplified.

The metal to be cast is introduced through the feed hole 49 in the reservoir 32. The centrifugal apparatus 10 is started revolving and then the reservoir 32 is dumped over by means of the hand wheel and the metal is then emptied into the revolving cylinder. This is accomplished from the fact that the upper part of the reservoir 34 is open or slotted. The metal emptied into the revolving cylinder is forced by centrifugal motion to the sides and forms a shell or tube.



New Process of Casting Tube Shells by Spinning.

# Questions and Answers.

QUESTION No. 1245. In making chloride of silver from the nitrate by throwing it down with common-salt, we notice that it turns black after a time. What is the cause of this and does it do any harm? We desire to use the silver chloride for making a silver plating solution by dissolving it in cyanide.

*Answer.* Silver chloride turns black or dark colored upon exposure to the light. It is caused by some of the chlorine in it escaping and a sub-chloride being formed. It has no effect at all on the silver plating solution as cyanide will dissolve it readily and this is all that is desired.

QUESTION No. 1246. We are asked to furnish a bronze valve or pump to withstand 1500 lbs. pressure. The metal is ½ to 5/8 in. in thickness. Can you recommend any alloy to fulfill this condition?

*Answer.* You will find the following mixture excellent for this purpose and it cuts very freely. The nickel in it promotes solidity:

| | |
|---|---|
| Copper | 83 lbs. |
| Tin | 5 lbs. |
| Zinc | 5 lbs. |
| Lead | 5 lbs. |
| Nickel | 2 lbs. |

QUESTION No. 1247. Can black nickel be deposited in a plating barrel? We desire to give safety pins a black nickel deposit but desire to use a plating barrel.

*Answer.* Black nickel does not seem to lend itself well for plating in a barrel. The reason appears to be that the black deposit is a very poor conductor of electricity and when the deposit forms it then causes a poor contact so that the current passes with much difficulty. The same is true of basket plating. The basket becomes coated with the black nickel and impedes the passage of the current. As far as we know, black nickel is not being plated on small metal goods in a plating barrel.

QUESTION No. 1248. What is the regular composition of the metal used for die-castings?

*Answer.* Every maker of die-castings seems to use a different mixture, but there is very little change in the proportions, however. The following is a favorite formula:

| | |
|---|---|
| Zinc | 75 lbs. |
| Tin | 15 lbs |
| Copper | 5 lbs. |
| Aluminum | 5 lbs. |

These proportions can be modified to suit different cases, although die-castings are usually required to be as strong as possible.

QUESTION No. 1251. Can sulphuric acid be used with the same results as boracic acid in a nickel solution? We have been told that any acid will do. We have heard of citric acid being used.

*Answer.* You cannot use sulphuric acid in place of boracic acid. It is the strongest acid known and a slight excess will prevent the deposition of the nickel. Boracic acid, on the other hand, even if present in such an excess that it will seperate out of the nickel solution, has no effect on it and for this reason is very advantageous as it is practically "fool-proof". We have never seen the same results produced by other acids either and as far as known, there is ns substitute for boracic acid in a nickel plating solution. It is now extensively used.

QUESTION No. 1252. Can you inform us what composition of a brand bearing metal called "Noheet-Metal" is? This is used for a packing and babbitt-metal and seems to have a lead base. Whe have had it analyzed but the chemist reports only lead with a little antimony. There must be some other metal in it as the report gives less than 1% of antimony which, of course, would not harden the lead appreicably.

*Answer.* This metal consists of lead and metallic sodium and it is to the sodium that the hardening of the lead is due. The small amount of antimony which your chemist found was an impurity in the lead. Sodium, even in small amounts, has the property of hardening lead and this is due to its low specific gravity. It is lighter than water. The following analysis was made of this metal at one time:

| | |
|---|---|
| Lead | 98.51% |
| Sodium | 1.30% |
| Tin | 0.08% |
| Antimony | 0.11% |

The tin and antimony were impurities in the lead. This amount of sodium hardens lead so that it will ring. Sodium alloys with lead easily and is accomplished by plunging it underneath the surface of the metal by means of tongs. Sodium should be kept under oil as it slowly oxidizes with the formation of caustic soda upon exposure to the air. It should never be brought in contact with water as it decomposes it with explosive violence and is then dangerous. When kept away from water, however, there is no danger as it alloys with the lead quietly.

QUESTION No. 1253. What kind of flux should be used in hard soldering of platinum?

*Answer.* You will have to use the same flux that is employed in the hard soldering of gold or silver. That is fused borax or boracic acid.

QUESTION No. 1254. I am desirous of knowing what would be the best binding material between graphite and brass. The article is a lubricating bearing. I wish to insert a graphite bushing into a brass tube and what shall I use for holding the graphite firmly in place?

*Answer.* There is no binder that can be used to make graphite adhere to the brass. You will have to mix the graphite with a binder, however, to make it solid so that it can be inserted. Clay (free from sand or grit) or plaster of Paris can be used. The mass thus obtained must then be forced into the brass. Recesses, holes or other depresessions will have to be used to hold it. These should, preferably be dovetailed in order to prevent the graphite mass from becoming loose.

Question No. 1255. We have a round steel push-button, brass plated and which is to be finished in "brush-brass". We are using pumice and water. We want to do them cheaper. Is there any method that can be used that is cheaper and can it be done without using water?

*Answer.* You will not be able to improve upon the method you are now using of producing the finish by means of water and pumice. Emery paste or cake is often used, but it is not as satisfactory as pumice and water as it leaves the work greasy and the grease must then be cleaned off. Water cannot be dispensed with in using the pumice as the finish is not good without it.

Question No. 1256. We have a quantity of tin-dross each month which we have been selling, and wish to reclaim the tin ourselves. What kind of a furnace is employed for this purpose and can it be done in a crucible?

*Answer.* Tin-dross is always smelted in a reverberatory furnace although small quantities, of course, can be done in crucible. A flux of soda-ash is used and this attacks the crucible so that it will not be found satisfactory. A special reverberatory furnace is used for tin-dross smelting and either oil or soft coal can be used for the fuel. Soda-ash is a good flux to use. The electric furnace is now being used with good success also for smelting tin-dross, but has not vet come into very extensive use.

Question No. 1257. There is a certain finish produced on cheap steel buckles that I have been unable to match. This finish is a sort of golden yellow, and shows traces of green and blue, although the greater part of the buckle is the yellow. The yellow is rather dark, more inclined to a brown. This, I know, is not produced by a lacquer, although the buckles were afterwards lacquered. Can you tell me what the finish is? I send you a sample indicating what it is.

*Answer.* The finish on the buckle is produced in the well known manner of using hyposulphite of soda and acetate of lead in the following proportions:

| | |
|---|---|
| Water .................... | 1 gallon |
| Hyposulphite of Soda ...... | 4 oz. |
| Acetate of Lead ........... | 4 oz. |

The solution is used hot and the metal dipped into it. It can be used on any metal without previous plating. Several colors are obtained by this solution and when you have obtained the right one, remove the article, rinse, dry and lacquer. Unless you lacquer the buckles or other articles, the finish will quickly fade.

Question No. 1258. In making an alloy composed of the following, what is the method used in melting the metals:

| | |
|---|---|
| Aluminum ............. | 82 lbs. |
| Zinc .................... | 15 lbs. |
| Copper ................ | 3 lbs. |

*Answer.* The best method of making the alloy such as you mention is as follows. Place the copper in a crucible and melt it under a layer of charcoal, then add the aluminum and lastly the zinc. Another good way is to place the copper in the crucible with the same amount of aluminum, when melted and stirred, add the remainder of the aluminum and then the zinc. The copper should always be melted first.

Question No. 1259. Is there any varnish or resist that can be used in the rubber stamp process of etching which will not be attacked by gold or copper plating solution?

*Answer.* As far as known, there is nothing which can be used. The principle of the rubber stamp method of etching lies in the fact that the gum-guaiacum for the resist is soluble in the potash on the face of the rubber stamp. As copper and gold plating solutions, that can be used for plating steel, contain alkali, this resist will not stand. The resists which will stand the alkali in the plating solutions, cannot be used in the rubber stamp method of etching.

Question No. 1263. What is the cause of nickel salts crystallizing the anodes. My solution stands about 7° Beaumé, but find that the anodes are covered with the salts in many cases.

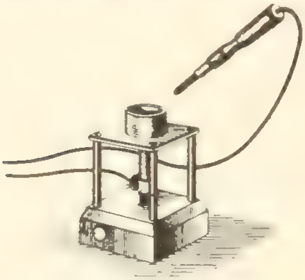
*Answer.* The trouble is caused by cold weather. This causes the salts to become less soluble in water and they crystallize out. The fact that the anodes are in the solution, causes the salts to adhere to them. You will have to warm your solutions in cold weather and you will then find they will work much better.

Question No. 1262. In the course of our work, we desire to use a brass of rather high melting point. A tungsten brass was suggested to us by one of our men. We have carefully looked up the literature on the subject, but have found none dealing with brass of this kind. In addition to the tungsten the alloy would, of course, contain copper, lead and tin. Can you give us any information on this subject?

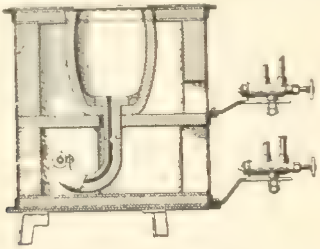
*Answer.* We are unable to give you any information on the use of tungsten in brass. As far as we know, it has never been used. It is probable that it would raise the melting point of brass, in proportion to the amount introduced, but it would also produce casting properties that would be problematical. Tungsten, of course, has a very high melting point, and you would first have to make an alloy of copper and tungsten and then use this for making your brass. Little is known on the subject.

## Patent Abstracts.

1,049,043, Dec. 31, 1912. ELECTRICAL MELTING AND SOLDERING APPARATUS. Willie M. Bowles and Charley O. Allen of Shawnee, Oklahoma. The apparatus is used for melting small quantities of metals. A small crucible is placed on a stand with an electrode under it. The other electrode is held in the hand near the metal in the crucible and the arc produced melts the metal.

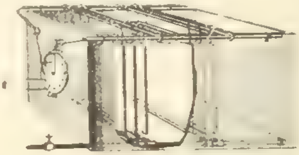


1,049,314, Dec. 31, 1912. APPARATUS FOR ATOMIZING METALS. James Millar Neil of New York City. A device for making finely divided metal. The process and appliance, while adapted more particularly for atomizing zinc for use in the cyanide treatment of gold ores, may be used for other metals. The molten metal is blown from a nozzle, through the agency of superheated steam under high pressure. In principle, the apparatus is like the ordinary atomizer. The steam supplies a reducing atmosphere, preventing the oxidation of the zinc.

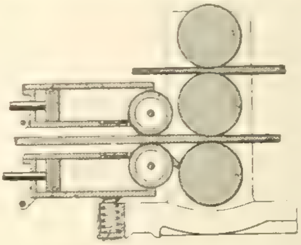


1,050,065, Jan. 7, 1913. NON-INFLAMMABLE CELLULOSE COMPOUND AND METHOD OF MAKING SAME. Wm. Godson Lindsay of New York City. Assignor to the Celluloid Co. of Newark, N. J. Triphenylphosphate is combined with acetyl cellulose and a compound having great strength and tenacity is produced. The material is used in the same manner as ordinary celluloid.

1,047,995, Dec. 24, 1912. PROCESS OF ETCHING PLATES BY ELECTRICITY. E. G. Schwuchow and G. F. Johnston of Chicago, Ill. A process for etching plates for use in printing. The plates are etched by electricity and the electrolyte or solution employed is a mixture of common-salt and sal-ammoniac. The plates, covered by the resist, are made the anode. The solution is made saturated with the salts mentioned and a current of 10 volts tension is employed. This gives rapidity on account of the high current density obtained at this voltage.

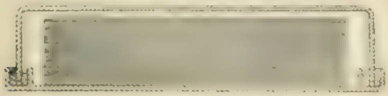


1,050,880, Jan. 21, 1913. UNITING METALS. Frank L. O. Wadsworth of Sewickley, Pa. A method of making compound sheet metals. Copper coated sheet steel is mentioned as one of the chief products that can be produced by the process. Powdered copper is applied to the surface of the metal (sheet steel) and worked into it by rolling, which the inventor describes as "kneading". There is produced, it is stated, by this operation an alloy of iron and copper. The required thickness of copper is then applied by welding, electropositing or melting. Special forms of corrugated rolls are employed for the "kneading" operation.



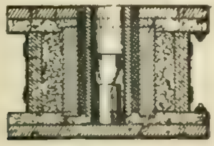
1,048,268, Dec. 24, 1912. SAFETY STOP FOR WIRE DRAWING BLOCKS. Louis J. Altenhoff of Donora, Pa. Assignor to the American Steel & Wire Co. A device for automatically stopping the wire drawing block when the operator becomes caught in the wire, or when snarling or kinking of the wire takes place

1,047,616, Dec. 17, 1913. SCALING AND ANNEALING METALS. Sherard Osborn Cowper-Coles. In order to prevent the formation of a film of oxide, or slight discoloration on metals that are annealed, they are enclosed in a receptacle to keep out air and deleterious gases. The articles being annealed, it is stated, may then be cooled rapidly without oxidation or staining. The process, it is mentioned, is applied to metals annealed in an atmosphere of reducing gas.



1,050,678, Jan. 14, 1913. PROCESS OF REMOVING COPPER FROM OTHER METALS. Raul R. Moreno of Allentown, Pa. The invention relates to a process of removing the copper from the interior of guns and which has been produced by the projectile "fouling" it. Methylamin is used as solvent for the copper and the steel, it is stated, is not attacked. Ammonia may also be used, it is claimed.

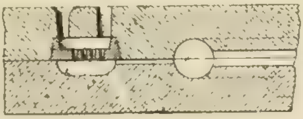
1,048,144, Dec. 24, 1912. METALLURGICAL FURNACE. Charles H. Fulton and William A. Coursen of Rapid City, South Dakota. An electric resistance furnace for melting metals. The features of the furnace are the production of a uniform heat, throughout the heating chamber and the resistance material is so distributed that equal capacity at every point is obtained. The resistance material used is cryptol or similar non-metallic substance.



1,049,799, Jan. 7, 1913. COMPOSITION FOR CONSTRUCTING MOLDS, CORES AND THE LIKE FOR USE IN CASTING. John William Bainbridge of London, England. The use of camphor in molding sand and cores is claimed in the patent. It is stated that this sand mixture is then more easily worked and can be used for both molds and cores. It is also claimed that the castings come out of the sand with a smooth skin. With the sand are mixed from ½ to 5 per-cent of linseed meal, and from 1/8 to ¼ per-cent of molasses and from 1 to 3% of camphor.

1,049,013, Dec. 31, 1912. PROCESS OF TREATING ANODE MUD RESULTING FROM ELECTROLYTIC REFINING. Harry Wehrlin of Steglitz, near Berlin, Germany. In the electrolytic refining of copper, the gold and silver, together with arsenic, antimony and lead are left undissolved in the form of slime or mud. In order to recover the gold and silver, it is necessary to treat this mud by a special process. According to this patent, it has been found advantageous to treat with a mixture of sulphuric and hydrofluoric acid. This solution is heated and air blown through it. The arsenic distills off in the form of fluoride, the antimony and any copper are dissolved and the gold, silver and lead left. These metals are then easily separated.

1,049,877, Jan. 7, 1913. PATTERN FOR SKIM-GATES. Herman H. Lange of Appleton, Wis. A skim-gate for use in casting metals in sand and for the purpose of removing or retaining dross, dirt, slag and other foreign matter that might flow into the mold with the metal. The skim-gate is in the form of a perforated core which is set in the sand mold and through which the molten metal passes before it reaches the mold itself.



1,047,521, Dec. 17, 1912. REVERBERATORY FURNACE. JOHN B. F. Herreshoff of New York City. Assignor to the Nichols Copper Co. of the same city. A reverberatory furnace for refining copper. The feature of the invention lies in the manner of preventing the disintegration or "floating-up" of the bed during the operation of the furnace. This is accomplished primarily by imbedding iron pipes in the bottom of the furnace and blowing air through to cool the brick or sand adjacent to them. Overheating of the bottom is thus prevented.

1,047,168, Dec. 17, 1912. WIRE DRAWING MACHINE. Elbert H. Carrol of Worcester, Mass. Assignor to the Morgan Construction Co. of the same place. A wire block with an automatic stopping device for controlling it when the wire should happen to become kinked or snarled.

# Trade Items.

The Rochester Brass & Aluminum Company of Rochester, N. Y. is having plans drawn for a foundry to be erected upon their property recently purchased on Marietta St. in that city. The foundry will be two stories high and will also comprise a machine shop.

The Bristol Company of Waterbury, Conn., makers of recording instruments, pyrometers, etc., are sending out to the trade, their new catalogues consisting of No. 1200 on "Bristol Class II Recording Thermometers" and condensed catalogue No. 160 of the "Bristol Recording Instruments".

Attention is called to the fact that Ledoux & Co., 99 John St., New York City are one of the oldest firms of assayers and analytical chemists in the United States. For years they have made a specialty of the assaying and analysis of copper and copper bearing materials, brasses, bronzes and the various white metal alloys. Their facilities are of the highest character.

R. B. Carolin, for a number of years foreman of the brass foundry of the Clayton & Lambert Mfg. Co. of Detroit, Mich. has severed his connection with that company, and has started in the brass foundry business at 825 Superior St. A jobbing brass foundry business will be carried on and aluminum, brass, bronze, and the special bronzes will be cast. Business has already been commenced. The foundry will be conducted under his own name.

R. F. Lang, 31-33 Broadway, New York City, who represents the United Chemical Works of Germany, has issued an attractive booklet setting forth the advantages of the "Royal Prepared Nickel Salts" and giving full information as to the preparation of the different solutions and manner of keeping them in perfect working order. Mr. Lang reports that the Royal Salts are meeting with an excellent reception in the trade, and he shows, with much satisfaction, testimonials from large concerns who have discarded their old solutions and equipped their tanks with the "Royal" salts.

The annual banquet of the National Electroplaters' Association will be held on Friday Evening, Feb. 21st. at the Broadway Central Hotel, New York City. A parlor will be open all day for members and guests, where samples of various finishes produced by the members will be on exhibition. Dr. J. W. Richards of Lehigh University, Dr. G. F. Kunz of Tiffany & Co., and H. B. Coho of the United Lead Co. will address the meeting. On Saturday Feb. 22, a delegation of members will visit the experimental plating department of the Hanson & Van Winkle Company at Newark, N. J. Tickets for the Banquet may be purchased from members at $1.50 or from the Secretary, Royal F. Clark, 246 Fulton St., Jersey City, N. J.

A new aluminum solder, which requires no flux, is being placed on the market by the National Products Co. of Kokomo, Ind. It is stated that the automobile manufacturers are now using the solder extensively and that it is giving much satisfaction.

The Bennett-O'Connell Co., 3600 South Morgan St., Chicago, Ill. are issuing the following new Bulletins: Bulletin No. 110 on their "Excell-All" Mechanical Plating Barrel; Bulletin No. 112 on their "Concord" Prepared Salts; and Bulletin No. 102 on their "Excell-All" Ball-Bearing Polishing Lathes. These Bulletins will be sent to those interested.

The William Berkel Chemical Works, 683 Communipaw Ave., Jersey City, N. J., are sending out a new circular describing their new product "Neutrol" for removing the carbonates in silver and gold plating solutions. This circular, and also the one previously issued, will be sent to those who desire it. Every silver plater should have a copy.

C. W. Parker of Leavenworth, Kansas, manufacturer of merry-go-rounds, shooting galleries, and other amusement devices, is to start up his nickel plating plant again. Some time ago, he was located in Albilene, Kansas and carried on nickel plating there, but the plant was moved to Leavenworth, and since that time has not been operated. All the equipment necessary is installed.

The Orford Copper Co. of Bayonne, N. J. has gone out of existence and has been succeeded by the International Nickel Co. The International Nickel Co. has been the holding company for some time. The Orford Copper Co. was started many years ago for the smelting of copper and for years turned out ingot copper. With the opening of the nickel mines of Canada, however, the smelting of nickel was carried on and now only the refining of nickel is done. The nickel is obtained from the Canadian mines in the form of matte and is then refined, either into Monel-metal or pure nickel. The office of the International Nickel Co. is at 43 Exchange Place, New York City.

The Bennett-O'Connell Company, 3600 South Morgan St., Chicago, Ill., are placing on the market their "Excell-All" plating barrel that is a radical change from any mechanical plating device that has yet been sold. The barrel is simple to operate and positive. It is rotated by means of a gear, driven by a belt from any convenient source. The barrel itself is suspended from sheave or gear and can be easily removed when a sufficient deposit has been put on. One feature of the barrel is the large amount of work exposed which, the makers claim is more than in any other form of barrel. No special anodes are required and the operation may be carried on at a low voltage. The successful operation of the tank is guaranteed at 6 volts.

A new plant has been started in Cleveland, Ohio by the Monarch Aluminum Ware Mfg. Co. for the manufacture of aluminum cooking utensils. The plant is located on East 49th. St. and the manager of the company is Raymond Deutsch.

A tract of land, 21 acres in extent, has been acquired by the Detroit Insulated Wire Co. of Detroit, Mich., manufacturers of insulated copper wire. This land adjoins their present plant and two large factory buildings have already been commenced. The large increase in the business has made this necessary.

White & Bros. Inc. of Philadelphia, Pa., scrap metal smelters and refiners and copper producers, are to erect a one-story addition to their plant at Hedley and Carbon Sts. Smelting furnaces will be installed in it. This company recently erected a new office building at their plant.

The Doehler Die Casting Co. of Brooklyn, N. Y., manufacturers of die-castings, are sending out to the trade their new catalogue describing the various products which they manufacture. This is an extensive catalogue and is illustrated with many excellent photographs of their plant and of their products. The catalogue contains much useful information in regard to die castings.

The Zenith Carburetor Co., 262-268 Jefferson Ave., Detroit, Mich. are contemplating the installation of a brass foundry at their works in that city. The company started some time ago to manufacture automobile carburetors after the design of one of the leading foreign makes and which proved very satisfactory in Europe. Heretofore, they have purchased their castings from outside parties.

The plant and business of the Whitlock Coil Pipe Co. of Hartford, Conn. has been purchased by the New Departure Mfg. Co. of of Bristol, Conn. A portion of the plant, however, has been leased back to the Whitlock Company who will conduct a pipe bending business in it. This plant is new and modern and is considered one of the best equipped in the country. A large brass foundry has been conducted by the Whitlock Company and large castings were turned out. A. S. Hyde will be the manager of the company.

The German-American Stoneware Works, 50 Church St., New York City manufacture stoneware for chemical purpose in any desired shape. This stoneware is made of clays which are absolutely acid-proof and are made with one purpose in view and that of holding acids. Ordinary stoneware, it is generally discovered, is far from acid proof. This company employs a force of chemical engineers who design stoneware for any special purpose that may be desired. Dipping tanks, vats, jars, kettles and other forms are made regularly and any special shapes will be made at short notice.

The Dominion Hose Coupler Corporation has been incorporated in Buffalo, N. Y. and will manufacture hose-couplings and other similar goods. The directors are George J. Waiter, Leonard Gloss and Frederick Dittmar, 405 Jefferson St.

The Bulgarian Government has recently given an order for nickel coins to the Berndorfer Metallwarenfabrik of Berndorf, near Vienna, Austria-Hungary. The coins will be minted in the Vienna mint, but the sheet nickel blanks will be made by the Berndorf company.

Leiman Bros., 62 K John St. New York City, manufacturers of sand-blasts and pressure blowers, are sending out a circular to the trade describing their rotary positive vacuum pumps for use with portable or stationary vacuum cleaning outfits. These pumps take up their own wear and are made upon the same principle as their well known blowers.

The American Brass & Plating Works has been incorporated in Louisville, Ky. with a capital stock of $8,000. This company succeeds the Houser Mfg. Co., 633 East Jefferson St. Thos. J. Hines of Hines & Ritchey, coppersmiths is at the head of the new company. It is stated that the plant will be enlarged in the future although not at present.

The American Manganese Bronze Co. of Holmesburg Junction, Philadelphia, Pa., manufacturers of manganese-bronze castings, recently cast some manganese-bronze work for the Panama Canal, which were exceedingly difficult to make. These were manganese-bronze bushings for the locks and weighed finished 630 lbs. The difficulty was caused by the shape, but they were cast without experiencing any trouble.

The regular meeting of the National Electroplaters' Association was held in New York City on January 24th, and thirty-five members were present. Two applications for active membership and one for associate were acted upon favorably. George B. Hogaboom addressed the meeting upon the method of removing carbonates from silver plating solutions. Mr. Hogaboom discussed the effect of carbonates upon the silver bath and also various phases which effect the successful working of this solution.

The Balbach Smelting & Refining Company of Newark, N. J. are one of the largest smelters of copper in the United States and purchase copper bearing material of all grades. Any material which contains sufficient copper to be of value will be purchased by them, no matter what form it is in. They also purchase all kinds of lead bearing material such as drosses, sediment, battery plates, sulphate, etc. Those having scrap materials of either kind should obtain figures from this company before disposing of it.

The Henry O. Rogers Silver Company was recently incorporated in Taunton, Mass. with a capital stock of $75,000.

The Metal Stampings Corporation has been organized in Streator, Ill. to take over the plant and business of the Streator Metal Stamping Co. of that city and which recently went into bankruptcy. The same line of goods will be manufactured.

A permit has been taken out by Thomas Savill & Sons of Philadelphia, Pa., manufacturers of plumbers' brass goods, for the erection of a new two story brass foundry. This will be located upon the property recently purchased by them at Wallace and Watts Sts. and will be 32 x 40 feet and a wing 30 x 40 feet.

Edgar T. Ward & Sons of Boston, Mass. are putting out on the market an alloy which they call "Capital Gun-Metal" and which they state is a perfect alloy of copper and tin. It has the appearance of gold and is malleable and ductile. They claim it is adapted for jewelry, watch-cases, fancy plates, bearings, springs, valves and machine parts. It is stated to be very non-corrosive and takes a high polish.

The Joseph Dixon Crucible Co. of Jersey City, N. J., manufacturers of graphite crucibles and other graphite products, have issued a new catalogue describing their full line of wares. This is a large treatise of 104 pages and illustrated with reproductions of photographs of all their goods. This catalogue, it is believed, will prove valuable to the trade as it will enable them to become acquainted with the line of graphite products made by this company.

The Aluminum Company of America, with main office at Pittsburgh, Pa. have obtained water power rights in North Carolina and Tennessee and, it is reported, will utilize them for the manufacture of aluminum. Electricity will be generated by the power and transmitted to some nearby town where the plant will be located in order to obtain suitable transportation facilities. It is also reported that the plant owned by the Aluminum Company at Massena, N. Y. will be extended during the coming year.

The year 1912 has resulted in the profits of the American Brass Company of Waterbury, Conn. exceeding that of any previous one and a gain of almost 36 per-cent or $400,000 over that of the year 1911. The profits for the year 1912 were $2,274,738 or 15.1 per-cent upon the capital stock of $15,000,000. For the year 1911, this was 9.6 per-cent and in 1910 amounted to 12.5 per-cent, while that for 1909 was 11.7 per-cent. The past year, therefore, has been a record one. During the year 1912, the individual plants of the company were amalgamated under one parent company known as the American Brass Company and have been operated as such.

A new factory building is being erected for Baer Bros. of Stamford, Conn., manufacturers of bronze powders. It will be 20 x 200 feet and one story high.

The Victoria Metal Co. of Erie, Pa. are to add the manufacture of white metal castings to their line. An addition, 50 x 100 feet is being built for this purpose.

The Northwest Brass Foundry Co. Ltd. of Montreal and Winnipeg, Canada, are to establish a foundry in Calgary, Alberta and which, it is stated, will cost $300,000.

Henry Ringhof, Essex Building, Newark, N. J., manufactures the celebrated "P & P" utilities and also the "Ideal" brand of polishing mediums and appliances.

The iron foundry of the P. J. Conroy Brass & Iron Co., 75th. St. and Island Road, Philadelphia, Pa., is to be reopened. This department has been idle for some time.

A new plant will be built by the White-Warner Company of Taunton, Mass. to replace the one recently destroyed by fire. The manufacture of stoves is carried on and the new plant will be sufficiently large to enable them to treble their output at the present time.

A permit has been taken out by Baker & Co. of Newark, N. J., manufacturers of platinum wares, for the erection of a new three story building of concrete. It will be 50 x 189 feet and will cost $73,000. The location will be on Murray St.

A movement is on foot to reorganize and continue the business of the Knox Automobile Co. of Springfield, Mass. which failed a short time ago. It is also reported that the Atlas Motor Car Co., the Springfield Metal Body Co. and the Brightwood Mfg. Co., all of Springfield, are to be consolidated with the Knox Company.

A new departure in the use of fuel-oil is to be started in Lawrence, Kansas. A company proposes to supply merchants and others in the business section of the town with oil for use in heating their buildings. This is to be done by a pipe line and the oil will be supplied the same as gas or water. Meters will be installed to measure the oil. A special, purified oil is to be supplied.

Two new platinum regions have been discovered in the Ural Mountains in Russia. The first is in the depths of the northern range, near the village of Verkh-Kosvja, and while the platinum bearing area is neither large nor rich, it is, nevertheless, worth working. This little village, consisting of only 25 houses, produces platinum to the extent of $1,000 per week and it is sold to neighboring mining camps for 9 rubles per zolotnik ($4.64 per 65.83 Troy grains). The other region where platinum has recently been found is in the Irbitski district, near the village of Pokrovskoie, on the River Bobrovka.

The Virden Mfg. Co., Cleveland, Ohio, manufacturers of brass goods, including lighting fixtures, have increased their capital stock from $10,000 to $25,000.

The Coronet Mfg. Co. has been incorporated in Cleveland, Ohio with a capital stock of $60,000 to manufacture automobile speedometers.

The Union Metallic Cartridge Co. of Bridgeport, Conn., manufacturers of ammunition, are to establish a branch factory in Edmonton (Alberta), Canada.

The brass foundry of the Buick Motor Co. at Flint, Mich. was destroyed by fire on January 17th. with a loss estimated to be $50,000. The foundry will be rebuilt as soon as possible.

It is stated that as a lubricant for use on tools in machining aluminum, bees-wax, is particularly good. A lump of wax is applied to the tool while it is in motion and sufficies, in the case of a drill, for several holes.

The V. E. Black Company of Providence, R. I., manufacturers of hat-pins, cuff-pins and other kinds of jewelry novelties, have moved to the Young Bros. factory building on Eddy St.

The Royal Motor Car Co. was recently organized in London, Ont. Canada with capital stock of $500,000, but has decided to build the factory at Strathroy, Ont. A factory, 200 x 400 feet will be erected.

The Cleveland Galvanizing Works of Cleveland, Ohio, makers of pattern letters, galvanizers etc., will shortly begin the erection of a new five-story addition to their plant. It will be of concrete. This company, in addition to the above lines, manufactures weldless chain.

The new plant of the Telephone Improvement Company of Galion, Ohio, will be completed in a month and it is expected will then be in full operation. The equipment of the North Electric Co. of Cleveland, Ohio, has been moved to this new plant in Galion.

The hammer business of the Humason & Beckley Company of New Britain, Conn. has been purchased by the Stanley Rule & Level Company of that city. The pocket knife portion of the business of this company was recently purchased by Landers, Frary & Clark who are manufacturing the same line of goods.

An appropriation has been incorporated in the river and harbor bill to be brought before the next Congress, for a survey of the Naugatuck River from Derby, Conn. to Ansonia, Conn. for the purpose of building a barge canal to the latter place. This will be the first section of such a waterway to be built to Waterbury, Conn. and the survey will be made to determine the cost and feasibility. When completed, if it should go through, the Naugatuck Valley cities would obtain water transportation from the coast as the river is already navigable as far as Derby.

The J. D. Bergen Company, Center St., Meriden, Conn., manufacturers of cut glass, are to commence the manufacture of metal novelties.

An addition to the factory of the Triumph Voting Machine Co. at Pittsfield, Mass. is being erected. This addition is 18 x 60 feet and two stories high.

The Buffalo-Erie Seamless Tube Company is erecting a plant in that city for the manufacture of seamless brass tubing. It is located on West 18th. St.

The Ideal Electric & Mfg. Co. of Mansfield. Ohio, manufacturers of elecric generators and other electric goods, have increased their capital stock from $50,00 to $150,000.

The Galion Brass & Bronze Foundry Company of Galion, Ohio will shortly place the contract for their new foundry plant to be built in that place.

The Aluminum Castings Company have abandoned their plant in New Kensington, Pa. and part of the equipment is being moved to Cleveland.

The American Radiator Company is to erect a factory in North Birmingham, Ala. at a cost of $500,000. The main building is to be 500 x 1050 feet.

The Oscar H. Horning Company has been organized in North Attleboro, Mass. to manufacture German-silver and sterling-silver novelties.

The Weidlich Bros. Company of Bridgeport, Conn., manufacturers of metal novelties, are to commence the manufacture of sterling-silver spoons. Souvenir spoons will be the line of goods manufactured for the present.

I. M. Jacobson & Sons, metal merchants and manufacturers of metal alloys, with general offices in the Ford Building, Detroit, Mich. have opened a metal warehouse and works at 70-72 Catherine St.

An increase in the capital stock of the National Tack & Screw Company of Cleveland, Ohio was recently made. The amount added was $500,000 and it will be used to increase the common stock of $1,250,000.

The Indianapolis Copper Company has been incorporated in Indianapolis, Ind. with a capital stock of $10,000 to manufacture copper, aluminum, brass and other metal goods. The directors are H. S. Steinbauer, J. J. Steinbauer and R. C. Dugan.

The Hoyt Metal Company, 111 Broadway, New York City, are sending out to the trade, an interesting folder describing the value of the "know-how" in making babbitt-metals. In it the following anecdote is given: An expert, who repaired a pump at a mine which was rapidly filling with water, sent in a bill of $500. Called upon to itemize it, he stated that the $500 consisted of $5 for repairs and $495 for "knowing how"

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98-99% | ℔. | .22 |
| Acid, Acetic, pure, 30% | ℔. | .07 |
| Acid, Arsenious (White Arsenic) | ℔. | .20 |
| Acid, Benzoic | ℔. | .55 |
| Acid, Boracic (Boric), pure | ℔. | .12 |
| Acid, Hydrochloric, see Acid, Muriatic. | | |
| Acid, Hydrofluoric, 30% | ℔. | .04 |
| Acid, Hydrofluoric, 50% | ℔. | .10 |
| Acid, Muriatic, 20° | ℔. | .02 |
| Acid, Muriatic, c. p., 20° | ℔. | .07 |
| Acid, Nitric, 38° | ℔. | 05⅝ |
| Acid, Nitric, 40° | ℔. | .05⅞ |
| Acid, Nitric, 42° | ℔. | .06¼ |
| Acid, Nitric, c. p., | ℔. | .08 |
| Acid, Sulphuric, 66° | ℔. | .01¾ |
| Acid, Sulphuric, c. p. | ℔. | .06 |
| Alcohol, Wood | gal. | .60 |
| Alcohol, Denatured | gal. | .55 |
| Alum | ℔. | .04 |
| Aluminum, Metallic, in Ingots | ℔. | .26½ |
| Ammonium Sulphate | ℔. | .07 |
| Aqua-Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | ℔. | 04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | ℔. | .06¼ |
| Ammonia Water, c. p. | ℔. | .08 |
| Ammonium Carbonate, lump | ℔. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | ℔. | .12 |
| Ammonium Hydrosulphuret | ℔. | .30 |
| Ammonium Sulphate | ℔. | .07 |
| Ammonium Suphocyanate | ℔. | .50 |
| Amyl Acetate | gal. | 3.50 |
| Antimony | ℔. | .09½ |
| Arsenic, Metallic | ℔. | .10 |
| Arsenic, White (Acid Arsenious) | ℔. | .20 |
| Argols, White (Cream of Tartar) | ℔. | .31 |
| Asphaltum, Commercial | ℔. | .05 |
| Asphaltum, Egyptian (Bitumen) | ℔. | .30 |
| Benzine | gal. | .15 |
| Benzol, Pure | gal. | .60 |
| Bismuth, Metallic | ℔. | 2.25 |
| Bitumen, see Asphaltum. | | |
| Blue Vitrol, see Copper Sulphate. | | |
| Borax, Crystals or Powdered | ℔. | .10 |
| Borax Glass | ℔. | .35 |
| Cadmium, Metallic | ℔. | .85 |
| Carbon Bisulphide | ℔. | .10 |
| Calcium Carbonate (Precipitated Chalk) | ℔. | .10 |
| Chrome-Green | ℔. | .50 |
| Copper, Lake, (carload) | ℔. | .16¼ |
| Copper, Lake, (cases) | ℔. | .16½ |
| Copper, Electrolytic, (cases) | ℔. | 16¼ |
| Copper, Electrolytic, (carload) | ℔. | .16½ |
| Copper, Casting, (carload) | ℔. | .16⅛ |
| Copper, Casting, (cases) | ℔. | .16⅞ |
| Copper Acetate (Verdigris) | ℔. | .35 |
| Copper Carbonate, dry | ℔. | .26 |
| Copper Sulphate (Blue-Stone) | ℔. | .09 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | ℔. | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | ℔. | .15 |
| Emery Flour | ℔. | .04 |
| Emery, F F & F F F | ℔. | .03 |
| Flint, powdered | ℔. | .01 |
| Flour Spar | ℔. | .01¼ |
| Fusel-Oil | gal. | 3.50 |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | ℔. | .30 |
| Gum Guiacum | ℔. | .26 |
| Gum Mastic | ℔. | .70 |
| Gum Sandarac | ℔. | .35 |
| Gum Shellac, brown | ℔. | .50 |
| Gum Shellac, white | ℔. | .60 |
| Iridium | oz. | 83.00 |
| Iron Perchloride | ℔. | .25 |
| Iron Sulphate (Copperas) | ℔. | .05 |
| Lead Acetate (Sugar of Lead) | ℔. | .15 |
| Lead, Pig | ℔. | .04⅜ |
| Lead, Red | ℔. | .12 |
| Lead, Yellow Oxide (Litharge) | ℔. | 12 |
| Liver of Sulphur, see Potassium Sulphide | | |
| Manganese, Ferro, 80% | ℔. | .10 |
| Manganese, Metallic, pure | ℔. | 75 |
| Magnesium, Metallic | ℔. | 1.60 |
| Mercury Bichloride (Corrosive Sublimate) | ℔. | 1.16 |
| Mercury Metallic (Quicksilver) | ℔. | .40 |
| Mercury Nitrate | ℔. | 1.50 |
| Mercury Oxide, yellow | ℔. | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | ℔. | .08 |
| Nickel Carbonate, dry | ℔. | .60 |
| Nickel Chloride | ℔. | .50 |
| Nickel Metallic | ℔. | .45 |
| Nickel Sulphate (Single Salts) | ℔. | 12 |
| Nitre, Saltpetre, see Potassium Nitrate | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Paraffine | ℔. | .15 |
| Phosphorus, yellow | ℔. | .40 |
| Phosphorus, red | ℔. | 1.10 |
| Pitch | ℔. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Chloride | oz. | 46.00 |
| Platinum Metallic | oz. | 48.00 |
| Potash by Alcohol, in sticks | ℔. | .60 |
| Potash, Caustic | ℔. | .05½ |
| Potassium Bichromate | ℔. | .14 |
| Potassium Bitartarate (Cream of Tartar) | ℔. | .31 |
| Potassium Carbonate (Pearlash) | ℔. | .10 |
| Potassium Chlorate | ℔. | .15 |
| Potassium Cyanide | ℔. | .25 |
| Potassium Iodide | ℔. | 2 25 |
| Potassium Nitrate (Nitre or Saltpetre) | ℔. | .10 |
| Potassium Permanganate | ℔. | .17 |
| Potassium, Red Prussiate | ℔. | .60 |
| Potassium, Yellow Prussiate | ℔. | .24 |
| Potassium Sulphide (Liver of Sulphur) | ℔. | 16 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | ℔. | 70 |
| Pumice, Ground | ℔. | 05 |
| Quartz, Powdered | ℔. | .01 |
| Rosin, Yellow | ℔. | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .62⅜ |
| Silver Nitrate, crystals | oz. | .50 |
| Soda-Ash | ℔. | .05 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | ℔. | .15 |
| Sodium Carbonate (Sal-Soda), crystals | ℔. | .02 |
| Sodium Hydrate (Caustic Soda) | ℔. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | ℔. | .45 |
| Sodium Hyposulphite ("Hypo") | ℔. | .04 |
| Sodium Metallic | ℔. | .90 |
| Sodium Nitrate | ℔. | .05 |
| Sodium Phosphate | ℔. | .09 |
| Sodium Silicate (Water-Glass) | ℔. | .04 |
| Soot, Calcined | ℔. | .15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | ℔. | .05 |
| Tin Chloride | ℔. | .43 |
| Tin, Metallic | ℔. | .49½ |
| Turpentine, Venice | ℔. | .35 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal. | .15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | ℔. | .45 |
| Wax, Carnauba | ℔. | .70 |
| Whiting (Ground Chalk) | ℔. | .02 |
| Zinc, Carbonate, dry | ℔. | .19 |
| Zinc, Chloride | ℔. | .12 |
| Zinc, Sulphate | ℔. | .06 |
| Zinc, (spelter) | ℔. | .06⅜ |

# THE
# BRASS WORLD
# AND
# PLATERS' GUIDE

**VOL. IX.** **BRIDGEPORT, CONN., MARCH, 1913.** **No. 3.**

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## Need for More Accurate Scales in the Brass Foundry.

We recently had occasion to visit a brass foundry which was experiencing difficulty in making a German-silver mixture containing 2 oz. of aluminum to 100 lbs. of the other metals. The castings were found to be too hard and had an excessive amount of shrinkage. A search for the trouble revealed the fact that the aluminum had been weighed on the ordinary platform scales employed for heavy work and capable of weighing a ton. It was found that the beam was graduated in 2 oz. notches and the scale was carefully balanced and the first notch used for the weight. "Good" weight was given too and instead of 2 oz. being weighed out (100 lbs. of the mixture were melted), nearly a pound had been obtained. The result, of course, is obvious. The mixture used, particularly sensitive to aluminum, had been hardened and given excessive shrinkage by the large and unnecessary quantity of aluminum used.

This experience has brought to our mind that the majority of brass foundries are not supplied with scales sufficiently delicate for weighing out small quantities of metals for use in making special alloys like manganese-bronze, phosphor-bronze etc. Usually but one pair is had and these are employed for both weighing out the mixtures, the metal as received and the castings sold. They do for the majority of work, in fact, for practically all of it for the reason that in the ordinary brasses, composition, bronzes or babbitt metals, close weighing is unnecessary and in addition, the amount of metals weighed out is large enough to offset any error in scale accuracy. When it comes to special alloys, like manganese-bronze, for example, the case is different. The mixture is very sensitive to any increase or decrease in the various constituents. For example, it is customary, in the best grades of manganese-bronze to add 0.75% of tin (or ¾ lb. to 100 lbs. of mixture). If, however, this amount is exceeded so that instead of 0.75%, 0.90% is used, the bronze becomes brittle and lacks the necessary reduction in area and elongation. It is also customary to use 0.50% of aluminum in the mixture. If this is slightly increased, through inaccurate weighing, the mixture will have a coarse fracture like that produced by an excess of tin, and will not have the required reduction of area and elongation. If too little tin or aluminum is used, then the bronze will become deficient in tensile strength.

The scales, upon which small amounts of metals are weighed in the brass foundry for making up special mixtures, are an important consideration, and we firmly believe that much of the difficulty experienced by the small brass founder with these alloys is caused by the employment of scales poorly adapted for the work on account of the fact that they cannot weigh small quantities with accuracy.

The increasing demand for special alloys, and the good prices obtained for them, should render their making of importance to the brass founder, and unless he is equipped for the work it will be found difficult to carry out the manufacture from day to day in a uniform manner. The usual difficulty, as previously mentioned, is the lack of sufficiently sensitive scales for weighing out the small amounts of metals to be used. For this purpose, scales similar to those used by druggists for their heaviest weighing are quite suitable and inexpensive, and are sufficiently accurate for any class of work that the brass founder is called upon to do.

## Why 18 Per-Cent German-Silver is Used for Flat-Ware.

The largest consumption of German-silver is in the manufacture of flatware. While a small proportion is sold without silver plating, the large majority is employed for silver plated ware. That used without being silver plated is usually of a higher percentage of nickel (generally 25% nickel) as this mixture is more non-corrosive than the lower percentages. The difference in non-corrosive properties between a 25% and 18% German-silver, however, is very slight.

The best quality of silver plated flat-ware is now made with an 18% German-silver base and this mixture has been adopted by manufacturers for the reason that it has the whitest color of any of the German-silver alloys. If less nickel is used in the mixture, the color inclines toward the yellow shade. If more nickel is employed, the color approaches that of nickel and the cost of the mixture increases. Therefore, the 18% mixture has been found the best suited as a base for silver plating. It is desired to obtain as white a mixture as possible, of course, and this percentage has been found by experience to give it. In addition it has practically as good non-corrosive properties as any of the German-silver alloys unless a very large percentage of nickel is used so that the difficulty of making becomes great and the cost is considerably increased. As a base for silver plating, 18% German silver seems to give excellent satisfaction.

For cheaper grades of silver-plated flatware, German-silver containing less than 18% nickel is employed, but the reason is always one of cost and not for any other purpose The percentage of nickel in such cheap grades of plated ware will run all the way from 10% up to 16% nickel, depending upon the price that has to be met.

In addition, lower grades of German-silver are frequently used for making hollow-ware for the reason that the sheet is not as hard as the 18% and works better. For the best grades of German-silver hollow-ware, however, 18% metal is used.

The common mixture used by German-silver manufacturers for an 18% metal is as follows:

| | |
|---|---|
| Copper | 62% |
| Zinc | 20% |
| Nickel | 18% |

With less nickel more zinc can be added, so that a low grade of German-silver is cheapened both by a less amount of nickel. but a greater amount of zinc, the cheapest metal in the mixture

# Steam-Metal Valve Castings; Their Leakage and Method of Overcoming It.

The greatest difficulty encountered in the manufacture of steam-metal valves is their leakage when tested. By this is not meant, of course, the leaks in the sense that the ordinary observer would imagine or around the joints or connections, but in the actual metal itself. In other words, when this kind of leakage occurs, the metal has the appearance of being porous.

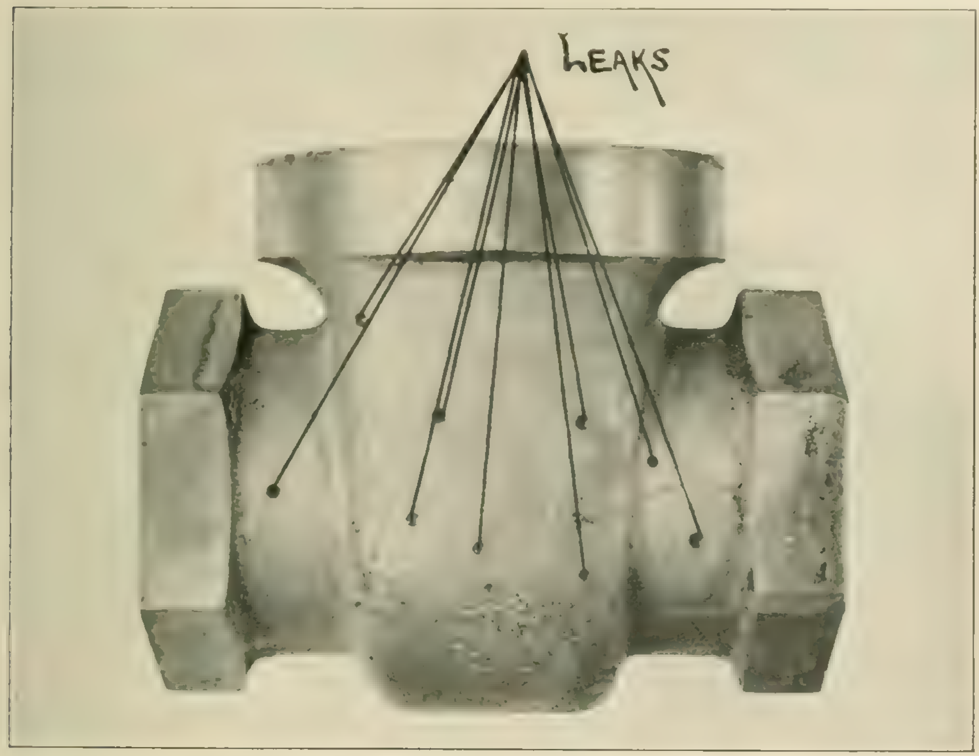


Fig. 1. Valve Casting, Poured Too "Cold" and Showing Places Where Leakage Occurred.

Valves are always tested before shipment and at varying pressures depending upon the class of work for which they are to be used. Valves to be used for hydraulic work, or high pressure steam lines, are always tested at a higher pressure than those to be employed for ordinary uses. Valves are generally tested after finishing as it has been found easier to do so than in the rough casting, and the actual finished product is then tested, a matter that is now considered good practice. In case of leakage, the only loss is in the machine work done on the valve, and this is not considered of much importance as the metal itself is not lost. The valves may be tested by water (hydraulic pressure), air or steam, and it matters not what means are used, if the valve casting is porous, leakage will occur. The walls of the metal contain cavities through which water, air or steam can pass.

The brasses and bronzes have the same properties as far as porosity is concerned, and it is a mistaken idea to believe that any one mixture will show less leakage than another. To be sure, there is a difference in the tensile strength, elastic limit, elongation and reduction in area, but the factor of safety employed in constructing a valve is so great that it matters not what the physical properties are. Leakage is never caused by any lack of tensile strength in the metal itself, but invariably from the presence of dross, blowholes or other imperfections in the metal. To be sure, one mixture may cause more of these imperfections than another, but the proportions of copper, tin, lead and zinc which may be present in a valve casting, can vary within very wide limits without in any material way affecting the leakage, although it has been found that to obtain the necessary physical properties, the mixture must remain nearly uniform. For this reason, it will be found that the steam-metal mixture used by each valve manufacturer does not vary to any great extent.

The cause of the leakage in valve castings is the presence of imperfections in the castings, and, therefore, it is a matter of foundry practice. Contrary to the belief of many persons, this is true and there is nothing else, provided, a suitable mixture is used, that will cause the difficulty. It is true, of course, that any metal with aluminum in it will give an abnormal number of leakages, but no one in the valve business would ever think of using such a mixture to put into valves. Given a suitable mixture, as now used by every valve manufacturer, and the cause of leakages can be traced every time to foundry practice, either in the melting, molding, pouring or in the making of the pattern. The metal itself, however, is quite important as there are some conditions which must be met and the presence of aluminum in the metal, too much zinc, or other abnormal changes, will necessitate such radical variations in the foundry that it cannot be met and the result will be an increased number of leaks. It is assumed, as almost invariably the case, that a mixture suitable for making valves is used.

The leakages in valve castings will run all the way from 3 to 25 per cent, depending upon the manner of melting and the foundry practice. A loss of 3 per cent is excellent, and if it is possible to keep the leakages down to this amount, then the manufacturer should consider himself exceptionally fortunate and believe his foundry practice cannot be surpassed. In the best regulated establishments, the leakage will ordinarily run about 5 per cent, when everything is going on normally and when the best methods for casting valves are used. As one maker says: "If the leakage of our valve castings remains at about 5 per cent, we are satisfied and are not disturbed, but if it begins to average greater than this amount, we immediately start and investigate in the foundry to ascertain the cause of the trouble." In many valve manufacturing establishments the percentages of leakages will run from 10 to 15 per cent and it is considered regular practice. This, however, seems excessive and would appear to indicate that there is some room for improvement.

On account of the leakages which occur, it is usually customary in many valve establishments to use new metals for the mixture to be used in the bodies and hubs or caps. The spindle, too, in large valves is usually made of new metal in order to obtain the necessary strength. The stuffing boxes and other small parts are made of scrap. Exceptions to these rules are small valves or those which are to be used, for low steam pressure or hot water. In such cases, all scrap is used. The use or avoidance of scrap does not determine, by any means, whether leakage will occur or not. In fact, it is a very common practice to lay leakages to the use of scrap, when, in reality, other things are the cause.

### *Cause of Leakages in Valve Castings*

The following are the causes, as far as now known, of the leakages in steam-metal valve castings:

1. Pouring the metal too "cold."
2. Too short gate.
3. Oxidation of the metal in melting.
4. Walls of valve too thin.
5. Aluminum in the metal.
6. Sulphurizing of the metal during melting.
7. Core-box or pattern badly made so that the casting is thick on one side and thin on other.
8. Wrong metal mixture.
9. Gated in wrong place.
10. Use of large quantity of phosphorus as deoxidizer.
11. Too little tin in the mixture.
12. Sharp corners on the pattern.

### *Pouring Metal too "Cold."*

The pouring of the metal too "cold" or at too low a temperature, as it is preferably called, is, unquestionably, the cause of more leakages than any one thing. It is the principal cause, in fact, and if valve makers would look after this one feature, they would find in it reason why their leakages have become excessive. Not only is it the principal cause of leakage, but is a matter very easily brought about by regular methods of foundry practice. Valve makers say: "We are making valves just the same to-day as we always did. Our patterns have not been changed in the least, we melt the same, use the same metal, and there has been no alteration in any way, shape or manner, and yet we find our leakages running up to a high figure, sometimes reaching 25 per cent. It must be in the metal."

When one comes to look this question "square in the face" it will readily be seen that cold pouring is about all that is left for the reason of his abnormal number of leakages.

As there is a reason for all things, there must be an explanation for the leakage produced by cold pouring. To explain it without actually coming in contact with the pouring operation would be difficult, but as soon as one really sees the effect of cold pouring and that produced by hot metal, he will at once realize that there is much to the matter; and when he watches the streams of metal entering the mold, one "cold" and the other at the right pouring temperature, he will at once realize that the temperature is the most important feature of successful valve pouring.

When steam-metal is poured, the stream of metal becomes covered or coated with a film of oxide on account of its exposure to the air. This oxide rapidly breaks off, as the metal runs, and passes in with the metal. Watch a stream of steam-metal going into the mold, at too low a temperature, and it will readily be seen. This oxide intermingles with the metal and acts like so much dirt. Frequently, if the temperature of the metal is too low, large pieces can be found in the casting and in Fig. 2 is shown such a piece. This is dross (oxide) pure and simple and is the cause of the leakage of the valve casting. This case of dross is, of course, an extreme one, but well illustrates how it looks and what its effect is on the casting.

If the steam-metal is poured "hot" (by this is meant the temperature at which the best results are obtained), the stream of metal running into the mold will have a different appearance. It will run clear and clean and there will be no film of oxide on the surface, but instead there will be a blue flame caused by the burning zinc as it is exposed to the air. It is this burning zinc that really solves the problem and the reason is as follows:

Zinc acts as a strong reducing agent, but it does not burn in the air unless the right temperature has been reached; and this temperature seems to be that which will cause the zinc to burn. If the stream of molten metal is poured at too low a temperature, the zinc does not burn but the tin, lead and zinc in the metal oxidize and produce the oxide film as previously explained, and which enters the casting causing leakage. When the temperature of the metal is right, the zinc burns on the stream of metal as it enters the mold and is exposed to the air, and actually prevents the formation of the oxides of copper, tin and lead while it is itself being oxidized The oxide of zinc, being so light, does not seem to cause the difficulty when it enters with the metal in the mold.

It will be found, therefore, that when the steam metal is poured at too low a temperature, the castings will have a good appearance, but will leak. In Fig. 1 is shown a valve body that was poured at low temperature, but which leaked badly in many places when a pressure of 70 lbs. per sq. in. was put upon it. Hydraulic pressure was used and in several of the places, marked with a prick-punch as shown, the water squirted out in a fine stream. When the metal is poured at a higher temperature, so that the oxide film does not form on the stream of molten metal as it enters the mold, the appearance of the casting may not be quite as good, but a far less number of leakages will result.

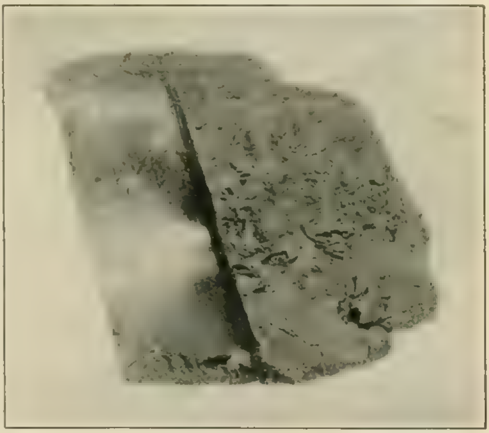


**Fig. 2. How the Dross Looks When Lodged in a Casting.**

It may safely be said that the presence of dross (oxide) in the metal is the cause of nearly all leakages. Even in metal poured at the right temperature, it will be found and whether it is present in a greater or less quantity will determine whether the valve leaks or not. In Fig. 3 is shown the surface of a valve casting which is supposed to be normal. The valve was a good one and had a good appearance. It did not leak. The surface was magnified and shows the small particles of dross that are present in the casting. If these particles of dross penetrate the metal, then channels are formed through which water or air can pass. To the naked eye, these particles cannot be seen, but the surface has a good appearance and magnified they become visible.

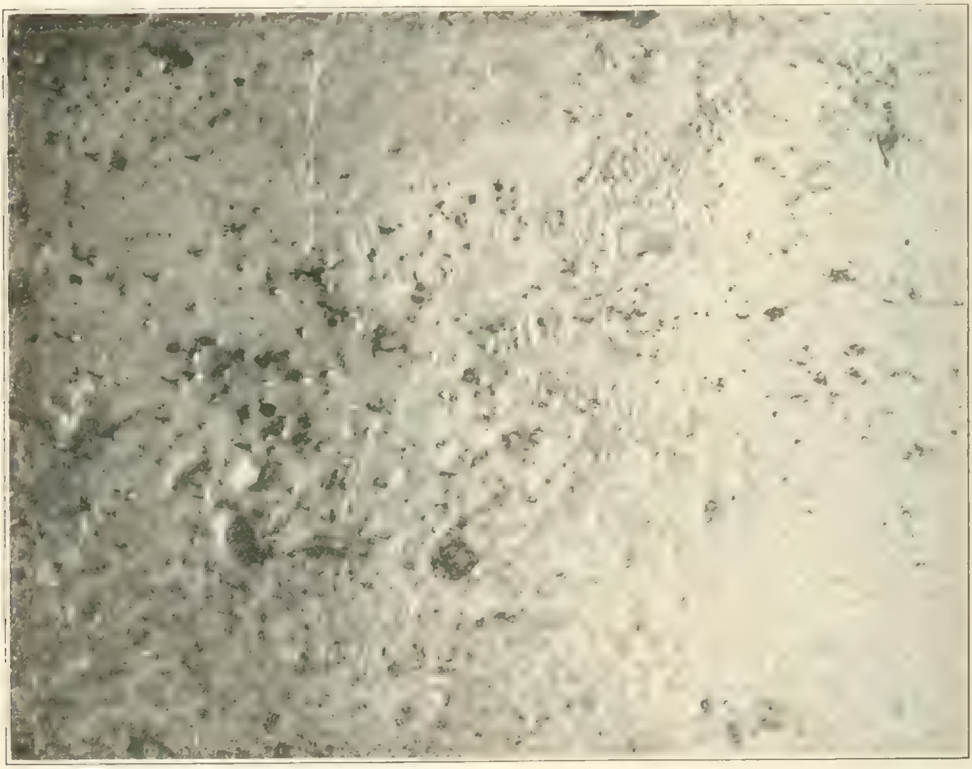


**Fig. 3. Magnified Surface of a Valve Casting, Showing a Normal Condition. The Manner in Which Dross Lodges May be Seen.**

Pouring too cold, therefore, is undoubtedly the real cause of valve leakages, and the effect is that small particles of oxide intermingle with the metal, enter the casting and form channels through which water or air can pass.

### *The Other Causes*

The other causes are easily remedied. Too short a gate allows dross to enter the casting and the result is the same as would be produced by dull pouring.

Metal overheated during the melting, or allowed to "soak" in the fire, after it has been melted, for some time is injured and oxidized Such metal forms dross readily and does not run as clean. The result is the lodging of dross in the casting and leakage follows.

The fact that the pattern is "skinned down" to save weight is often the cause of leakage. There is a limit to the thinness of the walls, but the average valve maker well knows that he cannot reduce the thickness too much This cause of leakage is not a frequent one.

Aluminum in the metal is a frequent source of leakage when scrap is used. This metal is now so prevalent that it is not surprising that it enters scrap. Even a few hundredths of a per cent. will influence the leakage, although not in a marked degree. As the amount increases, then the leakages become greater. The reason is that aluminum oxidizes very readily and the oxide film on the stream of molten metal, is not reduced by either hot or cold pouring or any other condition. The oxide enters the metal and forms channels through which water or air may pass.

Sulphurizing the metal during melting, caused by the use of scrap high in sulphur or fuels which contain it, is the cause of a leakage "tendency." Metals containing sulphur are dirty and drossy and this, as previously explained, is instrumental in filling the casting with particles of dross.

The use of a poorly made pattern can easily be remedied. Sawing a valve casting in half will readily determine whether the core fits the pattern so that the casting is even on both sides.

The use of a poor metal mixture is often instrumental in producing a greater percentage of leakages. Too much zinc, together with too little tin will often cause it. Such metal must be poured at such a high heat, on account of its sluggish nature, that there is an abnormal amount of spelter smoke given off and this enters the casting, causing imperfections.

Gating in the wrong place may cause leakage as it is well known that the portion of the casting near the gate, or at which the gate is joined, contains more dross than other parts.

Phosphorus, in the form of phosphor-tin or phosphor-copper is often used for deoxidizing purposes. If too much is used, it will cause pin holes in the casting and these will form cavities through which air or water may pass.

Too little tin in the mixture will cause local shrinkage in valve castings. A certain amount is required to cause the valve to remain even all over and shrink normally. It will be found that steam-metal with too little tin, will shrink in spots with a sort of depression. This may take place in the thick portions and usually does, but it results in the casting "drawing" and cracking. Cracks may cause leaks.

It often happens that in sharp corners, shrinkage results with the formation of a slight crack. This often results in leakage at the crack. Corners should be rounded with suitable fillets.

## The Manufacture of Brass Bedsteads in Italy.

The manufacture of brass beds is comparatively recent and of no great importance. The total output is estimated at about 1,000 per year. There are only two factories in Turin. Round and square brass tubes are imported from Birmingham, England, some round ones come from France, and occasionally tubes of both kinds are bought from Germany. The latter products are, however, less appreciated on account of the dull greenish color of the brass. All the ornamentation, knobs, joints, etc., are made in Italy.

The greater part of the manufacture of these beds is done by hand. Plates with a thickness of less than 1 millimeter (0.03937 inch) are hammered by hand or by means of a small automatic machine. The tubes, varying in diameter from 20 to 60 millimeters (0.7874 to 2.3622 inches), are bent without forging and set together with the utmost skill. A first coating is applied to the frame and to the plates and afterwards dried in a furnace. The whole is then varnished with a mixture of linseed oil and gum. It is again dried and afterwards ornamented by skilled decorators; transfers and pieces of mother-of-pearl or gold dust are also applied, and the whole is covered with a final coat of flatting. The attractiveness of the ornamentation plays an important part in the manufacture of these beds, and the ablest varnishers make as much as $12 per week.

It is believed that the varnishes, which used to come from England, are now made in Italy. The iron tubes are purchased in Italy, especially from the Ferriere di Plombina and the Ferriere dell' Isola d'Elba; Piemontesi gia' Vandel of Avigliana; the cast-iron parts, knobs, feet, and ornamentation are furnished by the three foundries known as Fonderie Ambrogio Necchi, in Pavia, which employ more than 3,000 workmen.

The blacksmiths and varnishers employed in the iron-bed industry are paid by the piece and receive wages varying from $7 to $11 per week.

The Turin customs authorities, in reply to the inquiry of this consulate, state that the Italian duty on brass tubes of any diameter amounts to $3.86 per metric quintal (220.46 pounds avoirdupois). No foreign brass beds are imported, and this is not only due to the scanty demand for them but also to the high duty, varying from $5.80 to $14.47 per metric quintal according to the ornamentation. Iron beds also are not imported from abroad because of the customs duties, which range from $3 to $5.80 per metric quintal according to the finish. *Daily Consular and Trade Reports.*

## Rinsing and Drying Plated Work.

To many persons, the rinsing and drying out of plated work seems a simple matter and, in fact, so simple that any comment on it would appear almost unnecessary. As simple as it may seem, however, there are many instances in which it is not done right and the plated work is injured thereby. The use of hot and cold water should be carried out in the right manner and it is in this fact that the errors are usually made.

When metal has been plated and is removed from the solution, it is necessary to rinse it in water to remove the plating solution which adheres to the surface. This should always be done in *cold* water, as it is always plentifully supplied in plating rooms, and in addition, it has the property of not drying off on the surface of the work. There is just one thing to be considered in using cold rinse water and that is to have plenty of it and if a possible thing, to have it running. What is wanted is clean water, and this is extremely difficult to obtain unless it is running. Work coming from a plating solution and dipped in a tub of cold water that is not running, may be cleaned, but the plating solution rinsed from the surface remains in the water, until by and by it has increased to a considerable amount. It then is transferred again to the hot water tank, and this, in turn is contaminated, until it begins to leave enough on the surface of the work, when dried off to injure it.

The cold water, used for rinsing, must be clean and this can only be obtained in a satisfactory manner by having it running so that it is always fresh. A rinse tank with two or three compartments, through which the water runs, is the best, and the work can be dipped into one and then the others and be sure there is no contamination at the last rinsing. This is the method used in the best establishments.

The object of cold water, as previously mentioned, is to remove the plating solution from the surface of the work. After this has been done, then it is necessary to remove the water from the surface of the work. This can be done in two ways.

1. By drying in sawdust.
2. By rinsing in hot water and drying spontaneously, or with the use of sawdust in conjunction with it.

The sawdust is preferably used in connection with the hot water treatment.

The hot water is employed to heat the work so that it will evaporate the water from the surface and leave it clean and dry and without stains. If plated work is allowed to dry in the air after it has been rinsed in cold water, the water evaporates so slowly that the surface has a good opportunity to stain and it usually will under these conditions. The object of the hot water is to heat the work, as previously mentioned, so that it will dry off very rapidly when taken from the hot water rinse tank.

The hot water employed for this purpose, must, by all means be perfectly clean. If cold water used for rinsing is not clean, then some of it is transferred to the hot water which gradually becomes foul and when it evaporates from the surface leaves a film of plating salts which will sooner or later stain or corrode the metal deposit.

There is more need of the cleanliness of the hot water than of the cold, but it is, in reality, impossible to do good work unless both are clean. Running hot water is rarely possible, but it should be carefully guarded and kept clean.

## Close-Plated Platinum Utensils.

The present high price of platinum has stimulated inventors to cheapen it in some way. There are no substitutes for it that answer the purpose. A number of patents have recenly been taken out by Byron E. Eldred of Bronxville, N. Y. for close plated platinum articles to take the place of platinum dishes, crucibles and similar apparatus used in the chemical laboratory.

The process consists of welding platinum to a base of steel or nickel and then rolling into sheet. A platinum coated steel or nickel is thus obtained. This is then spun into the desired shapes. The surface is, of course, coated with the platinum but the edges are exposed base metal. To cover these up, platinum is fused on the edges and a vessel or article is obtained completely coated with platinum, but at a much less cost than a solid platinum one could be made. The interior of steel or nickel can be made of sufficient thickness to render the articles quite stiff and rigid if desired.

## An Easy Method of Producing A Black Background on Button Shells.

Fancy buttons are now in vogue and they seem to be running into large sizes. These shown in the illustration are examples of the shells used in making the buttons. The manner of producing this particular finish has puzzled some button makers who, by force of competition, have been obliged to manufacture buttons with the same finish. The method of producing the finish is simple, and when well done it is an excellent and very pleasing one. The following is the process used:

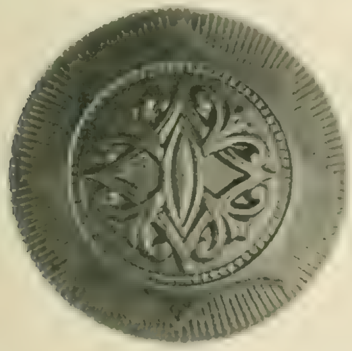


Fig. 1. The Shell After Lacquering with Black Lacquer.

The shells are struck up in a press from thin yellow brass sheet. A small hole is punched in the rim (cannot be seen from the front view) in order to allow stringing on wires. The shells are next strung, just as any small work would be treated, for dipping and coloring. Now run them through the potash kettle for the purpose of cleaning the grease and oil from them and afterwards rinse in cold water. Then run through a bright, acid dip in order to clean them and give a bright surface for the next operation. Rinse in cold water and carbonate of copper dip to give the surface a black color. This dip should be made as follows:

Take a quantity of ammonia water (whatever amount is necessary to give the required volume) and dissolve in it all the carbonate of copper it will take up and still have a very small amount which will not dissolve. It is very essential that there should be a little which will not dissolve. In other words, the ammonia should be saturated with the carbonate of copper. If it is not, the dip will not work well. Therefore, see that the ammonia will take up no more carbonate of copper If the ammonia water is very strong, water can be added to the solution so that it will not be too irritating to work over, but too much should not be added. Ammonia water, of course, gradually weakens upon standing so that it is preferable to use it full strength at the start and if found impossible to work over it in dipping, then add whatever water is necessary to reduce it.

Use this ammonia and carbonate of copper dip comparatively hot. It will not work cold. A temperature of about 150° F. is satisfactory. If much lower than this, the dip does not work very well, and if hotter, the ammonia gas is given off from it too readily and renders it difficult to work over. The usual method of heating it is to place it in a stone crock and surround with hot water.

The brass shells, dipped bright, as previously mentioned, are now immersed in the ammonia and carbonate of copper dip for a few seconds when they will be found to have turned black. Now remove, rinse in cold water, then in hot water and dry.

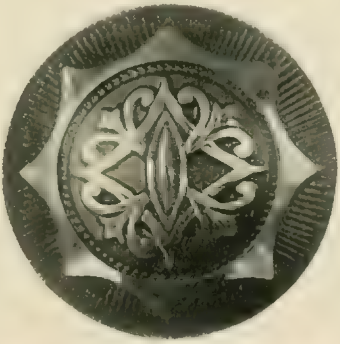


Fig. 2. The Shell After "Skimming-Off."

The shells are now blackened, of course, but this black is not what is desired for the final finish. In the first place, it is more or less "shiny" on account of the bright finish of the brass before immersion in the dip and of which condition it partakes; and in the second place, it has a blue-black color that is frequently undesirable. For these reasons, therefore, it is desirable to obtain a darker and dead finish. The black color given in the ammonia and carbonate of copper dip, however, is advisable and advantageous, inasmuch as it gives a base for the application of the lacquer finish to be subsequently applied.

The next operation is the application of a dead, black lacquer upon the front or face of the button-shell. It is unnecessary to apply it to the back. This dead, black lacquer is now a commercial article and can be obtained from any of the lacquer manufacturers. The best method of applying it to the shells is by means of a spray, although it may be brushed on. When this operation has been carried out, the shell has the appearance shown in Fig. 1. The whole surface is a dead black and, of course, may be left in this condition if such a finish is desired, but it is usually undesirable and imperative that some of the brass shall show. The "high-lights" of the figure design must, therefore, be relieved in order to show the brass underneath the lacquer and it is accomplished by the process known as "skimming-off." The shell is placed on a chuck in a lathe (made particularly for this kind of work) and the surface "skimmed-off" by cutting with a hand tool. This operation removes the lacquer and the black underneath produced by the ammonia dip, and leaves the yellow brass exposed. The button, after the "high-lights" have been skimmed off is shown in Fig. 2.

After "skimming-off" the button must again be lacquered in order to protect the brass, that has been exposed, from tarnishing and this is accomplished by means of a suitable transparent lacquer. The whole surface of the shell is lacquered in this operation, back and all.

The result is a finely finished button shell with a dead, black background that is so much desired.

## A New Aluminum Solder.

Another aluminum solder has been added to the already large number and this time it has been patented by Richard Seifert of Union Hill, N. J. The solder which he has patented is composed of the following:

| | |
|---|---|
| Tin | 38% |
| Phosphor-Tin | 32% |
| Zinc | 30% |

This solder, after melting and mixing, is used with 20% of its weight of rosin which acts as a flux. It is claimed that not only can aluminum be soldered to aluminum by means of this mixture, but to other metals as well. The soldering may be done with a soldering iron or blowpipe.

## Green Rouge for Buffing Platinum.

Platinum has now come into such extensive use in jewelry that it is not surprising that a modification of the process used for buffing it should have taken place. Many manufacturing jewelers are now using a green rouge instead of the ordinary red rouge for buffing it. They believe that a better "color" is obtained on the buffed surface.

Green rouge is made from chromium oxide, which itself is dark green, by incorporating it with the materials usually employed in rouge making.

Platinum is harder than gold, especially when alloyed with a small amount of iridium (as it usually is for most commercial work) and requires a harder rouge than can be employed for gold.

## Making Copper Hollow-Ware in Turkey.

The working of copper forms a special trade in Turkey and coppersmiths have their own quarters in every Turkish market. These are little shops, in each of which a master braizer and three or four apprentices pound copper into the required shapes. The only tools they use are an anvil and a hammer, the size of which depends on the kind of work to be done; there is no forge, no fire, and no machinery, yet it is wonderful to see what they accomplish with such simple tools. The master braizer earns about 80 cents to $1 a day, while the apprentices earn very little; but as soon as they learn the trade they open independent shops.

All copper utensils have to be tinplated before they can be used, otherwise the copper, coming in contact with acids, would be likely to cause verdigris poisoning. The tinplating is done in special shops, and also by men going round with portable forges. The process is very simple, consisting merely in heating the copper over a fire in a forge and dropping on it a piece of block tin and some chloride of ammonia, which are then rubbed all over the surface with a piece of cotton. Copper utensils of everyday use have to be tin plated at least once every three months.—*Daily Consular and Trade Report.*

# The Purification of Gold by Means of Nitre.

The purification of gold by means of nitre (saltpetre) is one of the oldest processes known for accomplishing this purpose and until the advent of the electrolytic method of gold refining, it was used almost exclusively. It is still used and is particularly useful for those who treat small quantities of gold or who only occasionally have gold to purify.

Gold is very sensitive to impurities and it is an agreeable fact that those which affect gold the most are the ones which are easily removed by nitre.

It must be borne in mind that gold cannot be purified in the full sense of the word by means of nitre, for there are metals which cannot be removed by it, but these are supposed to have been eliminated by parting previous to the treatment by nitre, so that if the process has been conducted as it should the nitre treatment will purify it. Silver is one of the metals that cannot be removed by nitre and is, of course, a very common impurity in gold.

The following are the metals which nitre will not remove from gold: Silver, platinum, iridium, palladium, osmium, rhodium and ruthenium. Silver, however, is the only metal that is usually present in the gold to be purified, although platinum is now and then present. Its value, of course, renders a special treatment necessary to recover it and if there is much present, it is removed previous to obtaining the gold from any source from which it may come. The other noble metals are never present in gold, although iridium is now and then found in gold that has been made into pens. Iridium is used for the points of gold pens and is soldered to them.

Nickel and copper can be removed to some extent by means of nitre, but not readily. They are not easily oxidized and the removal on any amount is almost impossible. Traces are removed in time but the elimination of these metals by means of nitre cannot be called a positive operation. For work in which ordinary gold is used, however, slight traces of copper usually do no harm, and even if not removed from the molten metal, it will not matter. Nickel is more difficult to remove than copper, but is not often present in gold to be refined. If much is present, then resort must be had to the wet process.

The following metals and elements are the ones which are so readily removed by nitre from melted gold. They are also the ones which cause the gold to be brittle or otherwise unsatisfactory: Tin, antimony, bismuth, tellurium, zinc, iron, lead, arsenic, aluminum, and sulphur. All of these metals or elements may be present in the form of traces in gold, and may cause it to be brittle in rolling or working. A few thousandths of a per-cent of tellurium will cause gold to crack in rolling and lead, tin, iron or the other metals are frequently present in amounts sufficient to injure the gold.

The Gold After Nitreing.

The method of purifying gold by means of nitre is to throw small amounts on the surface while it is in the molten condition. Nitre gives off oxygen when melted and it is this oxygen which act so beneficially in purifying the gold from its impurities. These metals in the form of impurities are oxidized by the oxygen set free from the nitre and pass into the nitre itself which now exists on the surface of the molten gold in the form of a slag By the use of a sufficient quantity of nitre, all the oxidizable metals may be removed. It is a valuable property of gold that it is not in the least affected by oxygen when melted and this fact allows the impurities to become oxidized without injuring the gold. This treatment with nitre was, in former times, called "toughening" and it is not at all unsuitable.

### *The Nitre*

Either potassium nitrate (nitre or saltpetre) or sodium nitrate (Chili saltpetre) may be used for purifying the gold. The sodium nitrate is the cheaper of the two and gives equally as good results. It may be in lump or powdered form although the lump is preferable as it is easier to throw it on the gold while melted. If the lumps are large they should be broken up as too much nitre should not be thrown on at once.

### *Melting the Gold*

The gold is always purified by nitre while in the melted condition. If the amount of gold to be treated is small, always use a clay or sand crucible as the operation is then more certain. If a graphite crucible is used, the nitre, when it is thrown on the surface of the melted gold, fuses, immediately floats to the edge and comes in contact with the graphite, instantaneously oxidizing and burning it. This results in using up the nitre so that it has no action on the gold, but rapidly destroys the crucible. The action of the nitre on the graphite is readily noticed by the flare which follows when the two come in contact with one another. When clay crucibles are used, there is no such action and the full value of the nitre is obtained. To be sure, there is a slight fluxing action on the clay or sand crucible by the nitre, but it is not large, particularly in good clay crucibles, and detracts but very little from the full value of the nitre.

If a large quantity of gold is to be nitred, then it will be necessary to use a graphite crucible for the operation and the effect of the nitre on the graphite may be offset by the following procedure: After the gold has been melted, cover the surface with a layer of bone-ash, about a quarter of an inch or so thick. Make a hole in the middle of this bone-ash to expose the gold and then put the nitre in this spot. The bone-ash around the sides of the crucible will effectually prevent the nitre from coming in contact with the graphite. As the nitre is added from time to time and the impurities oxidized and slag is formed, the bone-ash will absorb this slag and become pasty. It should then be skimmed off and a fresh quantity be put on. In this manner the nitreing may be continued as long as necessary.

In the case of the clay crucible, which is the way in which the operation will usually be done on account of the fact that small quantities of gold will generally be treated, the gold is melted and a small piece of nitre thrown on the surface. This is allowed to act for a few minutes and another piece thrown on. This is again allowed to act until it fuses down to a clear liquid and another small quantity added. After a time, there will be quite a layer of melted slag on the surface and it may be removed, when necessary by introducing a little bone-ash to thicken it and then skimming off. After this has been done, more nitre may be added and the operation repeated as often as desired.

In melting the gold, it is well to use a comparatively small quantity in the crucible. If filled not over half full, it is better and a crucible of a size that will warrant this amount should be selected.

### *Indications of the Slag*

There are no sharp indications in regard to the point when the nitreing has been sufficient, but the appearance of the slag will show partially. If copper is still in the gold, the slag will be green, while lead will give the familiar yellow color to it. The nitreing, however, should be continued until a test shows the gold to be sufficiently pure. This may be indicated by allowing to cool and taking a sample and assaying for fineness, or by testing mechanically for its rolling or working properties. Both tests may also be combined, if desired. If the amount of gold operated upon is small, then it is advisable to cast it and work it by rolling, and if it has not been found sufficiently purified, remelt it and again give it a good nitreing. In the case of large gold melts, this procedure is not advisable, but a sample may be taken and tested while the remainder is the molten condition in the crucible.

### *The Final Purification*

There is no way of actually ascertaining, while the gold is in the crucible, whether the gold is sufficiently purified except by long experience. Workmen who were accustomed to nitre gold at the New York Assay office, say that the point could be ascertained to some extent by watching the surface of the gold. If it becomes covered with a film of oxide when exposed to the air, it indicates that impurities still remain in it and further nitreing must be carried out. If, however, the surface of the molten gold remains clear and is not covered with an oxide film, the gold is purified.

This may be true of gold purification for bringing up the fineness to the Government standard, but it will hardly do for the purification of gold from very objectionable elements like tellurium. In fact, this feature of the process was discovered at the New York Assay Office many years ago when it was first discovered that tellurium was the cause of more or less trouble.

Experience in nitreing will indicate to a fairly good degree when the gold has been purified, but if it has been found upon working that the impurities have not been entirely eliminated, then it is a simple matter to remelt and treat again.

The length of time consumed in nitreing not only depends upon the amount of impurities present, but the quantity. Of the common impurities, copper is the most difficult to remove and lead the easiest. If the only impurities in the gold are small amounts of lead, antimony and iron, then the length of time consumed in the purification may not be over ten or fifteen minutes. On the other hand, when large quantities of gold are operated upon and there are large quantities of impurities present and considerable copper, then the nitreing may take days. Indeed, it has been frequently noticed in the New York Assay Office that a pot of gold amounting to a thousand or more ounces, consumed several days before complete purification resulted, but tellurium was present and this element, as previously mentioned, is removed only with considerable difficulty. The ordinary process of nitreing, however, as it takes place in the shop of the manufacturing jeweler or other gold worker, is not a long job.

It will usually be found that when gold refuses to work well and cracks in rolling, that impurities are the cause. A short nitreing will generally remove them and the gold will be rendered malleable.

It must be borne in mind, however, that the purification of gold by nitre should only be carried out on the fine metal. Alloyed golds, of course, become brittle, by imperfect melting, pouring too hot, or the use of impure copper for the alloy. These cannot be treated with nitre as the copper will be oxidized out and the gold fineness raised. It is only in the purification of fine gold that nitre is to be employed.

## Use of Metallic Tantalum for Electrodes.

In the *Chemiker Zeitung*, 35, 1912, pages 1233-1234, O. Brunck has published some interesting information in regard to the use of metallic tantalum as electrodes. He says:

"Metallic tantalum, which was originally manufactured solely for use in metal filament lamps, has recently been introduced as a substitute for platinum for certain purposes. Shaped articles of tantalum are sold at 2½ marks per gram or about $16 per ounce.

Below 200° C. tantalum is not attacked by air or oxygen, nor by acids, with the exception of concentrated hydrofluoric acid. It is not affected by aqua-regia. Aqueous solutions of alkalies have no influence upon it, but it is attacked by fused alkalies. It oxidizes at a temperature considerably below a red heat when heated.

Tantalum has proved very useful for surgical and dental instruments, and the author has found it very suitable as a substitute for the platinum electrodes used in electro-analysis. As a cathode, tantalum can replace platinum in all cases, but when used as an anode, it becomes coated with a badly conducting film of dark blue tantalum oxide, and for this purpose it is necessary to coat it electrolytically with a thin deposit of pure platinum before use.

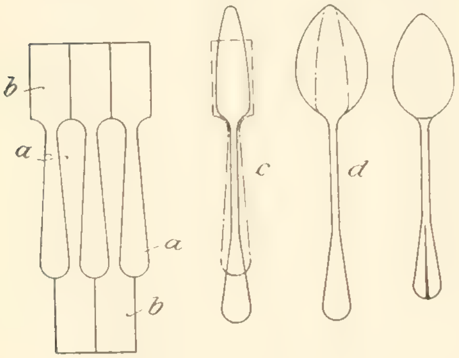
When used as a cathode for the electrolytic determination of metals, tantalum possesses the advantage that the deposit can be removed by dissolving in acid or aqua-regia. Zinc and cadmium show no tendency to alloy with tantalum when deposited upon it. A further advantage of tantalum compared with platinum, apart from the actual difference in price of the two metals, is that tantalum has specific gravity of only 16.6 compared with 21.48 for platinum, and hence less metal is needed in making articles of a given size. Tantalum electrodes could also be used in place of platinum in the electrolysis of alkali chloride solutions for the manufacture of bleaching solutions.

## An Improvement in the Method of Making Flat-Ware.

An improved method of making spoons and forks from sheet metal has been patented by Herman Krüger of Berndorf, Austria-Hungary (U. S. Patent 1,053,406, Feb. 18, 1913.) It is stated in the patent that the process is equally applicable to any of the various kinds of metal from which flat-ware is made. Referring to the sketch accompanying this article, the inventor describes his patent in the following manner:

"Figure 1 represents a plurality of blanks. Fig. 2 represents the shape of one of the blanks after the first operation. Fig. 3 represents the shape of a blank after the second operation. Fig. 4 represents the finished article.

FIG.1 FIG.2. FIG.3. FIG.4



Method of Making the Flat-Ware.

Referring first to Fig. 1, the shape of the blanks is such that the material left between the handles *a* of two adjacent blanks forms the handle of a third blank which is arranged displaced 180° relatively to the two former blanks, which arrangement is well known in itself. The blanks are consequently alternately cut out in reverse positions, so that no loss of metal is caused; according to my invention each blank is shorter than the length of the finished spoon, but is nevertheless composed of exactly as much metal as is subsequently required for the finished stamped spoon without any burs being formed, or in other words the quantity of metal in the blanks according to Fig. 1 is exactly equal to that in the finished spoons. In order to make the blade *b* of the blank of a shape and length favorable for rapidly obtaining the finished article, I pass it edgewise between two superposed rolls, not shown, of such section that the shape of the blade *b* is changed from that shown in Fig. 2 in dotted lines into that shown in full lines. Simultaneously or, if preferred, in a special operation, the handle *a* of the blank is also rolled or pressed edgewise into such a shape and such a length that it is suitable for being subsequently stamped, so that the half-finished blank or work-piece *c* represented in full lines in Fig. 2 is obtained. Owing to the metal of the original blanks being pressed edgewise it is so distributed that when the work-piece *c* is subsequently stamped or pressed the final outline of the finished article *d*, shown in Fig 3, is obtained at once without any waste of material, whereupon the bowl of the spoon, ornamentations on the spoon, and the like, can be made in known manner (Fig. 4.)."

## English Regulations for Celluloid Workers.

In view of the frequency with which fatal accidents occur in factories concerned with the manufacture of celluloid goods, the Birmingham authorities have addressed a circular letter to those firms who manufacture or otherwise handle celluloid, setting forth a number of precautions which might be taken for the prevention of accidents. The precautions include the provisions of a detached fireproof building for storage, in which the use of naked lights should be prohibited. An exit door should be provided at or near each end of all rooms where celluloid is used, or where that is impossible, it is suggested that the celluloid or xylonite should be used only on the top floor and at the end of the room farthest from the exit. The danger of leaving shavings on the floor is emphasised, and it is suggested that labelled metal bins should be provided for their storage, and that the floor of the room should be swept regularly In order to prevent ignition by friction the circular recommends that any tools used in the various processes should be kept cool by running water, and that the cutting edges be kept as sharp as possible. Naked lights should be not less than three feet away from the materials. A final warning is given that employees should be told of the inflammable and dangerous nature of the material, and that the fire-extinguishing appliances on the premises should be adequate and kept in good order.—*The Ironmonger*

# Some Experiments on the Effect of Sulphur on Copper.

**By Erwin S. Sperry.**

It is now beginning to be appreciated that sulphur is a more injurious element in copper and its alloys than generally believed. All fuels, whether coal, coke, oil or gas, contain more or less sulphur, and in the case of coke or coal, at the present time it is usually "more." The quality of these fuels does not appear to be growing better.

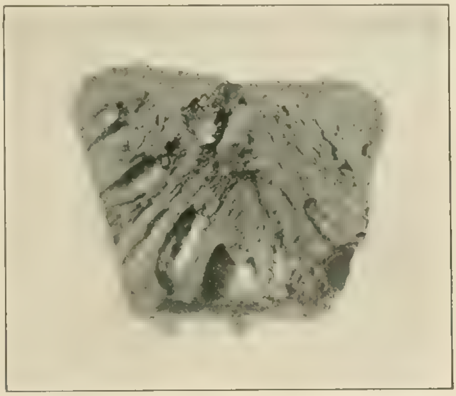
As all fuels contain sulphur and copper and its alloys have an affinity for this element, it is quite natural to presume that each time metal is melted it absorbs some of it and it actually does. The singular fact and one that produces such unsatisfactory results, however, is that each time metal is melted, a greater or less amount of sulphur is absorbed from the products of combustion and it remains in it as it will not free itself or become oxidized out in any subsequent melting. In other words, the sulphur is constantly increasing as the metal is melted over and over. I firmly believe that this was the reason in the past for such antagonism towards scrap metals. Much of this aversion was undoubtedly well founded as the quantity of sulphur in it was so large as to prevent the successful manufacture of brass or bronze castings. It also explains why washings and similar material that have had very intimate contact with the fuel, are always poor material. The very fact that sulphur is constantly increasing in scrap materials is an important one.

Little attention has been given the presence of sulphur in the brasses and bronzes. The average analysis never shows it, although it has an important bearing upon the subject and should always be determined for a complete analysis. It seems to influence the casting qualities and the color of the cast surfaces an,d in addition appears to cause blowholes. Just how much sulphur can be tolerated in brass or bronze has yet to be determined and nothing seems to have been done to determine it. As a matter of fact, it has only recently been appreciated that sulphur is quite an injurious element in these metals.

Apropos of this fact, the following experiments on the effect of sulphur on copper, made some time ago, may be of interest. While they do not determine the effect of sulphur on the brasses in the form of sand castings, they may serve to indicate some of the irregularities that take place when sulphur is present in copper to a greater or less extent. The experiments made are:

### *Experiment No. 1*

Melted 10 lbs. 5 oz. of Lake Superior Copper in a graphite crucible in an anthracite coal fire in the usual manner. Kept covered with charcoal when the melting was taking place in order to prevent oxidation as much as possible. When melted and at the heat ordinarily used for adding zinc to it to make brass, 4 ounces of lump sulphur were introduced. This was added in small pieces at a time and the crucible shaken after each addition. It was not stirred as it was desirous of avoiding the introduction of any iron. The metal was then poured into small strip ingots in an open mold.



Fracture of the Copper Containing Sulphur.

The copper ran well and apparently as thin as it would were no sulphur present. The sulphur did not seem to render it sluggish at all. The metal smelled very strongly of burning sulphur while it was being poured and bubbled with a sort of effervescence. The metal set readily without any swelling or expulsion of gas. The top of the cooled ingots were covered with a black scale like ordinary copper. The copper was rather brittle and broke easily with a short fracture and blowholes were present in it. The copper had a peculiar red shade, rather inclined towards a light bronze, or perhaps like that of a red brick had it a slight metallic lustre.

The copper seemed to cut like a poor leaded brass and the chips were short. It was wholly unlike the ordinary copper with its unsatisfactory cutting qualities. The following analysis was made of the copper:

| | |
|---|---|
| Sulphur | 1.06% |

The next experiment was practically a repetition of the one just described, and is of interest as indicating that the copper apparently took up nearly the same amount of sulphur.

### *Experiment No. 2*

In a graphite crucible in the manner previously described, were melted 17 lbs. 14 oz. of Lake Superior copper and 15 oz. of lump sulphur added in small pieces at a time and the copper stirred with a graphite stirrer. Poured into an open mold in the form of strip ingots. Smelled very strongly of burning sulphur while being poured. While the ingots were "setting", a sort of effervescence took place at the top. There was a “sizzling sound and gas appeared to escape though it could not be seen. The sound, however, was apparently produced more by chemical action than otherwise on account of the separation of sulphide of copper on the top of the ingots on cooling.

The copper ran well and did not seem to be sluggish. The metal was short and the fracture light colored and slightly crystalline fibrous. While the copper could be bent a little before breaking, it was quite short. The fracture contained blowholes. An analysis showed:

| | |
|---|---|
| Sulphur | 1.04% |

A peculiar feature of this experiment was the fact that after cooling, the ingots were all covered with a thick, black scale which proved to be sulphide of copper. This scale was about an eighth of an inch in thickness and could readily be separated from the metal. The line of separation between the ingot and the scale was very distinct. This scale formation and separation were apparently the cause of the "sizzling" sound heard during the cooling of the ingots.

A remarkable thing in this experiment was the fact that the amount of sulphur in the copper was practically identical with that in the first experiment, although a much greater quantity of sulphur was used. This fact would appear to indicate that only a certain quantity of sulphur will combine with copper and that this amount is about 1 per cent. If more sulphur is added it combines with the melted copper, but separates out while cooling in the form of copper sulphide. Copper, I believe, from these results combines with a definite amount of sulphur.

### *Experiment No. 3.*

Melted 21 lbs. of Lake Superior copper as before and then added 24 oz. of sulphur. Poured into ingots. The metal bubbled strongly while being poured and smelled strongly of sulphur dioxide gas, so that the pouring was difficult on account of these irritating fumes. The fracture of the ingot contained blowholes.

The ingots did not shrink or swell and "sizzled" while cooling. When cool, it was found that they were covered with the black scale as in experiment No. 2. This scale was analyzed and found to contain as follows:

| | |
|---|---|
| Copper | 80.31% |
| Sulphur | 19.69% |

This indicates that it is the cuprous sulphide as this compound contains, theoretically 79.84% of copper. The cupric sulphide contains 66.45% of copper.

The following analysis was made of the copper:

| | |
|---|---|
| Sulphur | 0.80% |

The effect of forging upon the copper is of interest. When heated red hot, it smelled strongly of sulphur dioxide. If the copper were heated to a good red heat ,or what would be called a high rolling temperature, it could be bent over on itself and flattened without cracking; but if the heat were low, or the so-called low red heat, it cracked, even when bent slightly.

The effect of lower percentages of sulphur was next tried, and 5 lbs. of Lake Superior copper and 5 lbs. of the copper obtained in Experiment No. 2 (1.06% sulphur) were melted together, and then poured into ingots. This gave copper as follows:

| | |
|---|---|
| Copper | 99.47% |
| Sulphur | .53% |

The copper ran freely without any film of oxide on the surface and the ingots did not shrink or swell. They "sizzled" while cooling like the ones in the previous experiment. The ingots were softer than the previous ones and would bend considerably before fracturing. The fracture was fibrous crystalline. The ingots contained blowholes in the fracture.

In forging the metal behaved peculiarly. It could be flattened well at all heats, but if bent, even 15 or 20 degrees, it cracked. This cracking when bent took place at all heats and is apparently a characteristic of copper containing sulphur.

*Experiment No. 5.*

Melted 9¼ lbs. of Lake copper and 3 lbs. 1-1/3 oz. of the copper obtained in Experiment No. 2 (containing 1.06% sulphur). Poured into ingots. This mixture gave the following sulphur content, figured from the sulphur in the copper used and an analysis was not made:

| | |
|---|---|
| Copper | 99.74% |
| Sulphur | .26% |

The ingots remained level after cooling and although they "sizzled" while this was taking place, it was not as violent as in the case of the copper containing more sulphur. The fracture of the ingots showed blowholes. In forging, it smelled of sulphur dioxide while red hot. The forging properties were exactly like those of the preceding experiment and the ingot, although it could be flattened out under the hammer ,would not stand bending at any heat, even to a slight degree. When flattened out under the hammer, very few edge cracks could be seen and these only when the edge became quite thin.

*Experiment No. 6.*

A mixture of 12 lbs. of Lake copper and 1 lb. 5-1/3 oz. of the copper obtained in Experiment No. 2 (containing 1.06% of sulphur) were melted together. When poured, it ran more sluggish than the copper in the previous experiments (containing more sulphur). In cooling, however, the ingots "sizzled" more strongly than in any of the other experiments and the tops of the ingots swelled. When this "sizzling" was taking place, sulphur dioxide gas was given off very strongly. When the metal was poured it smelled strongly of this gas. The mixture as made would show the following:

| | |
|---|---|
| Copper | 99.90% |
| Sulphur | .10% |

The fracture of the ingots was filled with blowholes, some of them very large.

In forging, the copper could be forged to a thin edge, but at any heat would not stand bending, even to a slight degree, without breaking.

Although the other samples of copper smelled of sulphur dioxide when heated for forging, this sample did not manifest this peculiarity.

*Experiment No. 7.*

The copper obtained in the last experiment was remelted and poured into ingots again. It behaved exactly the same. The ingots "sizzled" and swelled and the fracture was full of blowholes. In forging its behaviour was identical with that of the previous experiment.

*Conclusions*

The conclusions reached from these experiments were the following:

1. That copper will not absorb over 1 per cent of sulphur. If more is added to it, it separates out as cuprous sulphide on cooling.
2. That sulphur causes blowholes in copper.
3. That it renders the copper red short, particularly when bent.
4. That it produces a crystalline fracture when present in considerable quantity.

## The "Hall Marking" of Platinum in England.

In view of the increasing use of platinum in the arts and sciences and the fact that it is worth nearly three times as much as gold, the Jewellers' and Silversmiths' Association has suggested to the Assay Offices the desirability of establishing a system of Hall-marking of platinum wares so as to guard as far as practicable against the perpetration of fraud by the supply of mere alloys of platinum in place of the pure material. It is rather a mystery that the supply of platinum should continue to be so limited, as it is known to occur in several regions of the earth, and bearing in mind its great usefulness and the fact that for certain purposes there is no substitute. Platinum articles at 10*l.* or more per ounce are not the kind of goods which the average ironmonger can afford to stock in any quantity, but it is desirable that anything professedly made of this precious metal should be genuine and not a mere colourable imitation. As the Hall-mark proposals will, if adopted, bring grist to the mills of the Assay Offices, there is not much doubt, I should say, of these authorities agreeing to do what is asked of them.—*The Ironmonger.*

## Dip Gilding.

The use of the gold dip, without the use of the current, is of long standing, but it is very rarely used at the present time. In fact, it is not as attractive as the silver dip. Electro-gilding is so easily carried out, that it is almost exclusively employed. Various small articles, however, that are to be cheaply gilded, may be treated in the dip gilding solution.

Showing Some Articles Frequently Dip-Gilded.

The following solution from Roseleur is, perhaps, the most serviceable for general use and has the advantage that it does not deposit gold in the form of a black powder on standing, like some of the other dip gilding solutions. It is made as follows:

| | |
|---|---|
| Water ........... | 1 gallon |
| Caustic Potash ..... | 1¼ lbs. |
| Potassium Bi-Carbonate... | 2¼ oz. |
| Potassium Cyanide ...... | 1¼ oz. |
| Gold ..................... | 1/8 oz. |

The gold (2½ pennyweights) is made up into chloride and added to the solution of the other salts.

The solution is then used hot or at about 120° F. It has been found to work better after it has been boiled for an hour or so, the water which evaporates being added to keep the volume constant.

Brass or copper goods or those plated with these metals can be coated with gold by dipping into this hot solution. The surface, however, should be clean and free from grease or stain.

In using the dip gilding solution, there is one thing which should be borne in mind and that is, *do not have it too hot.* It deposits so rapidly when quite hot that the gilding will not be good, and will lack lustre. A temperature of about 120° F. or even less is more satisfactory than one that is higher. Perhaps it would be preferable to say that the solution should be *warm* rather than *hot.*

## Nickel Plating in a New Process for Making Gold-Leaf.

In a new process for the manufacture of gold leaf introduced by a London firm a highly polished aluminum ring about 5 feet in diameter and 5½ inches wide is covered with an adhesive substance, such as a solution of gum, and is allowed to dry. The adhesive surface is dusted with metallic powder so that it is covered with a very thin layer of base metal. This layer is polished and the ring is rotated slowly with its lower surface in contact with a solution of a nickel salt, the ring being connected with one pole of a battery, while the other pole is immersed in the nickel solution. An electrodeposit of nickel is thus produced on the polished layer of base metal. The nickel deposit is washed and the ring is rotated with its surface in contact with a solution of gold, the electrical connections being as before, so that the latter metal is electroplated on the nickel. There are thus four layers on the periphery of the ring, namely, gum, base metal, nickel, and gold, but each layer of metal is so thin that the combination is said to be even thinner than the best gold leaf.

To remove the leaf from the aluminum ring a transverse cut is made in the continuous film, and, starting from this cut, the ring is rotated slowly with its lower part immersed in a liquid which dissolves the adhesive substance, when the film falls from it and is received upon a band of paper travelling at the same speed as the periphery of the ring. The film and paper are then cut up and made into books.—*Daily Consular and Trade Reports.*

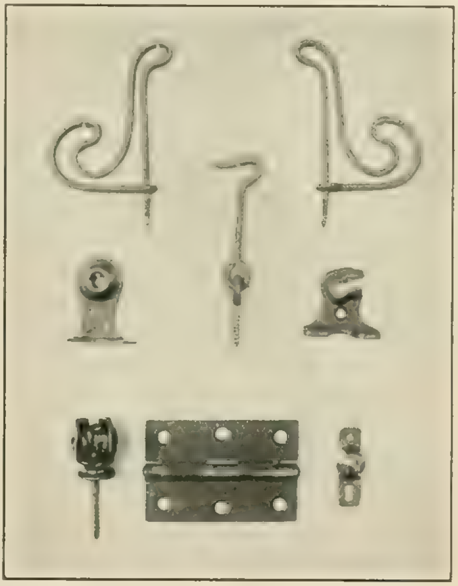
## Dip-Coppering Small Iron and Steel Goods.

The ordinary dip coppering formulas, as given in the different text books on electroplating, are not very satisfactory for the reason that they contain too little free sulphuric acid. They also contain less sulphate of copper than they should and work too slowly on this account. Considerable free sulphuric acid is necessary to produce a bright copper coating upon the iron and steel, and there must likewise be enough sulphate of copper in the solution to coat rapidly. Otherwise the dipping operation becomes too slow.

When bright and clean iron or steel is dipped into any copper solution that is neutral or acid, the copper deposits upon the surface by simple substitution. The iron dissolves and the copper takes its place. This fact has, of course, long been known and the cognizance of the fact preceded that of electrodeposition by many years. Use is made of this property superficially to coat small iron and steel goods with copper and it is still employed to a large extent for the cheapest classes of hardware which will not admit, on account of the price at which they are sold, of electroplating with copper in the usual manner. Large amounts of iron and steel wire are coppered in this manner and nearly every one is familiar with the well known coppered steel rods and wire so extensively used. While the amount of copper on the surface is very small, it acts beneficially in protecting the steel against rust, and for this purpose it is the cheapest process that can be used.

For the copper salt to be used for dip coppering, nothing has been found equal to the well known and easily obtained sulphate of copper. This is also called blue-vitriol or bluestone. It is the most common copper compound. If, however, bright iron or steel is dipped into a simple solution of sulphate of copper in water, the surface will not become coated with a bright deposit of copper. Instead, the coating will be dull anl lacking lustre. It will also be non-adherent and may easily be rubbed off the finger. If, however, some sulphuric acid is added to the solution, the copper coats the surface with a bright and strongly adherent layer. In order to make use of a dip coppering solution containing sulphate of copper, it is, therefore, necessary to have sulphuric acid in it.

The amount of sulphuric acid that can be present in the dip coppering solution seems to be quite variable and as long as there is enough in it to produce the bright coating, a greater excess does not appear to have very much influence. If too little is present, however, the copper coating on the iron or steel will lack lustre, and in addition is not apt to adhere well. A good proporition of acid has been found to be about 4 oz. (fluid) to each gallon of dip.



Iron and Steel Goods Coppered in the Dip Solution

As far as the amount of sulphate of copper is concerned, this too may vary considerably. If too little is used, the copper coats the surface too slowly, and if too much is used, the coating takes place so rapidly that so much covers the surface of the iron or steel, that it flakes or rubs off. A good amount has been found in 4 oz. of sulphate of copper to each gallon of dip.

The solution for use in the dip coppering of iron or steel has been found by experiment to give good results when used in the following strength:

*Dip Coppering Solution*

| | |
|---|---|
| Water ........ .... .... | 1 gallon |
| Sulphate of Copper ........ | 4 oz. |
| Sulphuric Acid ............ | 4 oz. (fluid) |

The sulphuric acid is ordinary commercial oil or vitriol and the amount given is in fluid ounces. Add the sulphuric acid to the solution last.

The dip-coppering solution is used *cold* for the reason that it not only works better but requires no additional apparatus for heating. Hot solutions coat the iron or steel too rapidly and the coating of copper will rub off.

The solution must be used in a stone crock or other non-metallic vessel. A stone crock is the best for the purpose and is what is generally employed. The work to be dipped may be in baskets, but if this is the case, then it must be shaken in order to expose all portions to the dip. If possible, the articles should be strung on wires as this gives the best results.

The iron or steel to be dipped must be bright, if a bright copper surface is desired, although the dip works equally well, of course, on dead or bright surfaces. Dead surfaces will give a dead coating of copper, while the brighter or more highly polished the iron or steel, the higher will be the lustre of the copper. As the majority of articles dip coppered are very cheap, it is very rarely the case that they are highly polished, but have been tumbled to as high a polish as possible. Frequently the steel or iron is left in the condition it is after coming from the press. The greater portion of the goods, however, have been polished by tumbling, and this is the surface generally seen on dip coppered articles. It may be unnecessary to mention that the dip coppering process is equally applicable to cast and malleable iron as it is to sheet steel articles.

One of the essential parts of the dip coppering operation is the cleaning of the iron or steel work previous to entering the dip. Grease or oil must be as completely cleaned from the surfaces as though electroplating was to be done, and this fact overlooked, usually results in a poor job. The copper will not adhere to the surface, but will peel or rub off. The grease or oil is cleaned off in any of the well known methods. If excessive, such as follows after machine work has been done upon the goods, then tumbling in sawdust or immersing in gasoline may be used for the removal of the greater portion of it. The final treatment, however, to remove the last film remaining on the surface is to immerse the goods in a hot potash or lye solution, then rinse in *cold* water and then at once into the dip.

It is a great error, in treating iron or steel goods, to allow them to remain in the air after they have gone through the cleaning kettle. The surface is then chemically clean and in the ideal condition to oxidize. If it is impossible to immerse the articles in the dip coppering solution after they have been cleaned from grease, then allow them to remain in a solution of sal-soda (sodium carbonate) in water until ready for use. This is made by dissolving 2 oz. of sal-soda in 1 gallon of clean water. The sal-soda will prevent rusting. When ready to use them, rinse in cold water and then run through the dip coppering solution.

After cleaning from grease, the goods are dipped into the coppering solution for a few seconds or until they become coated with a bright covering of copper all over. This takes but a few seconds and they should not be allowed to remain in any longer than for the time required to produce the bright copper coating. Longer time gives a heavier coppering which is apt to flake off.

When the desired copper coating has been produced, remove the articles and rinse in cold water thoroughly. This water should be clean and preferably running in order to remove all traces of the dip coppering solution left in between the work. Then rinse in hot water and dry out rapidly.

As copper, of course, tarnishes upon exposure to the air, a coating of thin lacquer may be used on it to a good advantage if the cost of the goods will admit it. The cheapest kind of lacquer will answer. If, however, this cannot be used, then the next best thing is to run the goods, after rinsing, through a hot soap solution.

Whale-oil is good for this purpose. Then rinse in hot water and dry off. There is a little of the soap solution left on the surface of the work so that it acts as a protective film. In other words, the surface of the copper becomes coated with a slight film of oil or grease which acts as a protective covering.

### *Reasons for Difficulties.*

If the copper is dark colored and dull and easily rubs off, after the articles have been run through the dip, it indicates that there is not enough sulphuric acid in the solution.

The copper coating is clean but lacks brightness, and flakes off. This indicates that the articles have been left in the solution too long or that there is too much sulphate of copper in it.

The articles do not take the copper readily and it takes some time for the surface to become well covered. There is then too little copper in the solution and more sulphate of copper must be added.

The iron or steel becomes coated well with a bright coating of copper, but it is easily rubbed off. This difficulty indicates that the surface of the iron or steel is greasy. When run through the potash or lye kettle, it will be found that the copper will then adhere.

## The Porosity of Cast Copper Anodes.

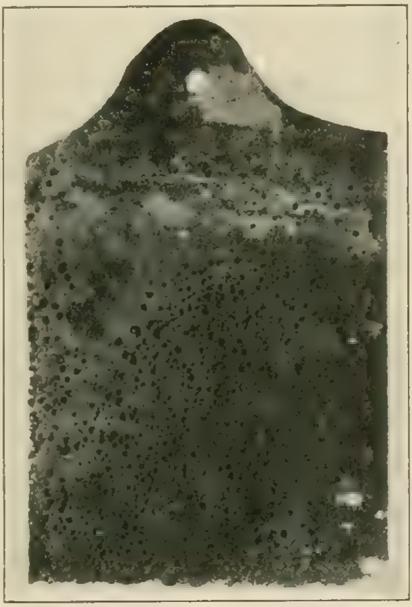
Pure copper is a very difficult metal to cast and it is very seldom that an absolutely sound piece can be obtained. More frequently are castings produced which are very porous and filled with blowholes. The one herewith illustrated is one of this kind.

The object of this article is to dispel the prevalent idea that the cause of this kind of porosity is the fault of the plating solution or the manner of running it. As a matter of fact, the difficulty is in the anode itself.

Porous castings of all kinds, whether they are of copper or any other metal, rarely show their porosity on the surface. The outside may appear sound and smooth, but when the interior is disclosed, either by machining or dissolving action (such as takes place when an anode is used in a plating solution), the blowholes are disclosed, just as they are in the anode in the illustration. In this particular instance, the cast anode was smooth before it had been used and no indications of blowholes were noticeable. The action of the copper plating solution, however, dissolved off the surface and made the blowholes visible.

The anode is not injured in the least by the presence of these blowholes. In fact, they give more surface exposed to the plating solution so that, in reality, they act more or less beneficially. The appearance is against them, of course, and in addition they are apt to make the anode dissolve unevenly so that towards the end of its life, it may fall apart and not waste away as smoothly and uniformly as a rolled or well cast anode. This difficulty may not always happen, however, with cast copper anodes containing blowholes, but only with those which are very bad and contain an extremely large number. Even then, it may not take place so as to give much trouble as all cast anodes are not apt to wear away evenly, or in a manner comparable with rolled metals. Taking it all in all, then, the presence of blowholes in cast copper anodes, although affecting their appearance, is not injurious.

It is not difficult, however, to make sound copper castings when so many good deoxidizing materials are now on the market and the addition of which to copper will prevent porosity. In the old days of copper castings, the only deoxidizing material used or known was zinc, and the anode herewith illustrated, was cast with an addition of 3% of this metal. While it acts beneficially, as far as small castings are concerned when they are cast in chill molds, it fails in sand castings. For this very reason, the casting of copper in sand was not a commercial success until other stronger deoxidizing agents were discovered. At the present time, it is possible to produce copper castings in sand as sound as any other sand castings.



**Porous Cast Copper Anode.**

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The addition of sal-ammoniac to an electro-galvanizing solution causes the anodes to dissolve more freely and the solution is then made more self sustaining.

## An Improved Method of Cleaning Silver Electrolytically.

The cleaning of silver and silver plated ware electrolytically is a subject that has recently received much attention. The principle is based on the fact that when two dissimilar metals are brought in contact in an alkaline solution, an electric current is set up which reduces any sulphide that may be on the surface. In order to carry this out in an alkaline solution, however, one of the metals must be acted upon to a slight extent by the alkali and for this reason zinc or aluminum is used

Fig. 1.

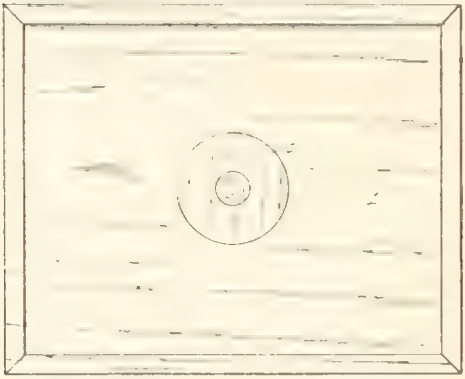


Fig. 2.

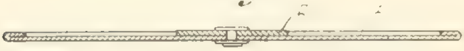
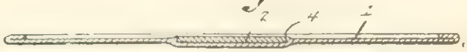


Fig. 3.



Appliance for the Electrolytic Cleaning of Silver.

An improvement in the process has recently been patented by Edward A. Hardy of Madison, Wis. The apparatus has been simplified and cheapened and consists of a zinc and copper plate herewith illustrated and made in the following manner:

1 is a zinc plate, and 2 is a copper plate. In the preferred form shown in Fig. 3, the zinc plate 1 is provided with a central depression 3 for the reception of the copper plate 2, and the marginal edge of such depression is upset so as to for an anular bead 4 which is bent over and adapted to engage the periphery of the copper plate 2, whereby said copper plate is securely retained in place in said depression. By the form shown in Figs. 1 and 2, the copper plate is secured to the surface of the zinc plate by rivets. The marginal edges of the zinc plate 1 are folded over upon themselves, thereby forming a strengthening bearing 5 by which the plate is stiffened and prevented from being accidentally bent out of shape.

When using the device, it and the silver plate to be cleaned are placed in a receptacle of the required size, when a sufficient quantity of the solution is placed in the receptacle to entirely submerge the plates to be treated. In forming the solution, preferably use one tablespoonful of salt and one of soda to each quart of water. The water is first heated to the boiling point when such ingredients are added. Then the heated solution is poured into the receptacle and allowed to remain for about ten minutes, after which time the plate may be removed, when the same is rinsed by the application of clean water, whereby the tarnish will be at once removed.

## Substitution of Tungsten for Platinum.

Metallic tungsten is one of the most interesting of the rare elements. Up to this time, however, the only commercial use for it in its elementary, metallic condition is electric lamp filaments. The reason for its employment in this form of apparatus is its high melting point and in this property it exceeds every other known metal. In other words, tungsten has the highest melting point of any metal. Its point is supposed to be approximately 5430° F. When it is known that platinum melts at 3191° F. and iron at 2768°, the infusibility of tungsten can readily be appreciated.

Owing to the increase in the price of platinum, it has been proposed to substitute tungsten for it in some of its uses, notably in electrical contacts. For this purpose, infusibility is very essential, for there is always a slight arcing which gradually destroys the surface of the two pieces of platinum employed as the contact points, and, therefore, tungsten, having a much higher melting point, would, theoretically, be preferable. As far as permanence in the air and freedom from corrosion are concerned, tungsten seems to answer the requirements.

In a paper on the "Recent Developments of the Electrical Art" published in the *Journal of the Franklin Institute* during the past year, Elihu Thompson, the well known inventor, makes the following remarks on the uses of tungsten and its possible substitution for platinum. These remarks are of much interest:

"Still, these later years are not without their technical triumphs in discovery and invention. The Edison carbon filament lamp, the influence of which on the growth of industrial electricity has been stupendous, was not known till the close of 1879. Improved in minor details, it remained for upwards of a quarter of a century without a rival for small units of light; the improvement coming by the substitution of tantalum and then of pure tungsten for the carbon; the gain in efficiency with the latter was such that approximately one-third of the energy would give as much light, and of a whiter and better quality. Tungsten had long been known in an impure state and in its compounds, and it was used as a component of special steels. Pure tungsten, as at first produced, was found to be a hard, glassy brittle metal, absolutely without ductility or malleability in the cold, yet by careful research and persistent effort methods were found which at last yielded wire which could be drawn cold.

This was done in the research laboratory at Schenectady, and drawn tungsten wire filaments are now the standard. The unyielding brittle metal has been made so tractable that a single length of over three miles of wire, of a diameter less than that of a human hair, has been drawn. Tungsten drawn wire has the extraordinary strength of 600,000 pounds to the square inch of section. Ductile tungsten is now found to be superior to platinum for electric contacts, and far less expensive. It is also the ideal material for the targets of Roentgen-ray tubes, not yielding where platinum would be melted rapidly in forcing the tube for the purpose of shortening the time of exposure in radiography.

Has the tungsten lamp reached the limit of its development? Certainly not. The knowledge gained in the past year or two renders probable a further advance in efficiency of lamps; leading to the confident expectation that more than 50 lamps of twenty candle-power each may be obtained from an expenditure of only one kilowatt of energy, or about 40 such lamps to the horsepower. These results may possibly be much exceeded, for the research laboratory is not yet through its work."

## Use of Cobalt-Chromium Alloy (Stellite) for Lathe Tools.

Stellite is the name given to an alloy of cobalt and chromium and discovered by Elwood Haynes of Kokomo, Ind. It has remarkable properties and is being used with excellent success for cutlery. It not only takes a fine cutting edge, but is very non-corrosive.

Mr. Haynes recently read a paper* on the "Alloys of Cobalt with Chromium and Other Metals" at the October 1912 meeting of Eighth International Congress of Applied Chemistry, held in Cleveland. Among other things mentioned was the use of the alloys for lathe and other cutting tools.

Commenting upon this use for cutting tools, Albert R. Ledoux† of New York City, made the following remarks:

"A prominent manufacturer of high-speed machinery, having seen the paper of Mr. Haynes, which was presented at the Cleveland meeting, informs me, that after a test he has adopted "Stellite" lathe tools throughout his plant. A comparative test gave the following results :

On phosphor-bronze, 125 feet per minute, using a superior high-grade steel. Using "Stellite", 900 feet per minute.

On tool-steel, when using superior high-speed tool steel, 80 feet per minute. With "Stellite", 133 feet per minute were cut.

On steel, seamless tubing, using high-speed steel, 100 feet per minute. Using "Stellite", 400 feet per minute.

On cast-iron, with the superior high-speed steel, a cut of 100 feet per minute was obtained. With the "Stellite" a cut of 200 feet per minute could be employed.

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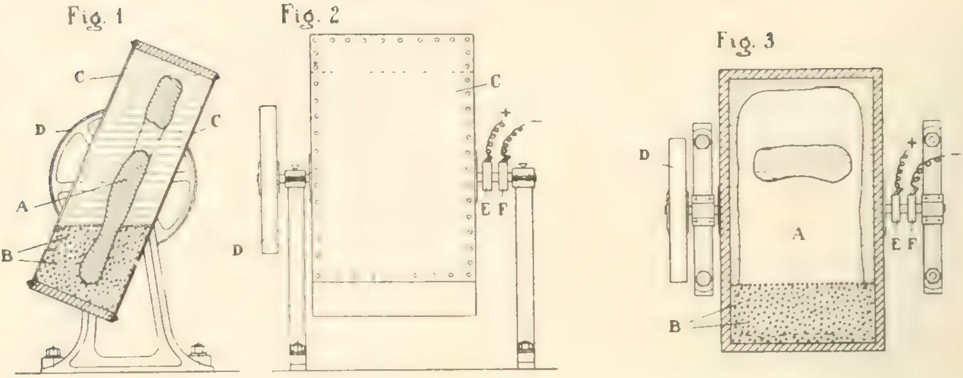
*Also reprinted in THE BRASS WORLD, January, 1913, page 21.

†See Am. Institute Mining Engineers, Feb. 1913 Bulletin, pg. 255.

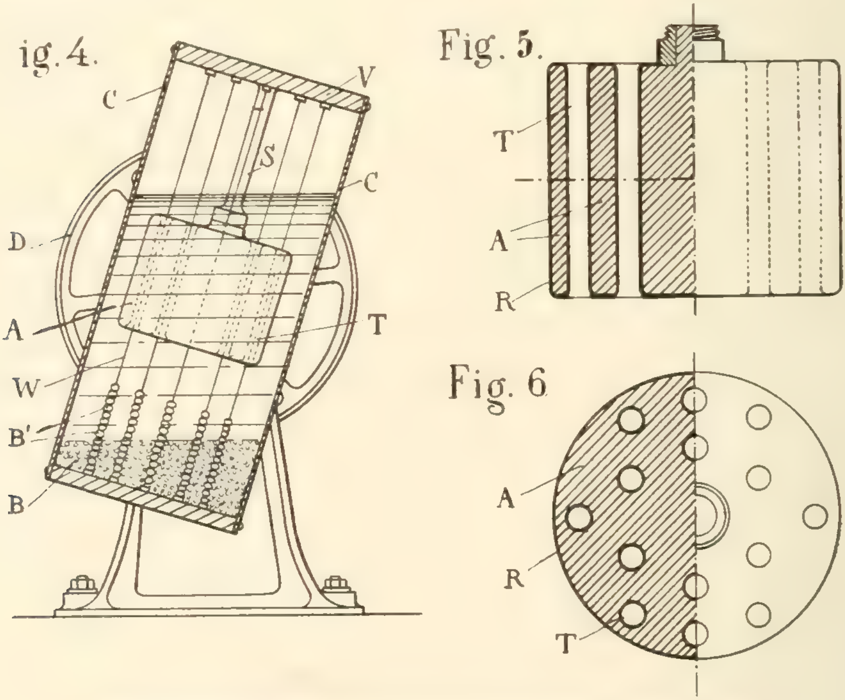


Sketch Illustrating the Method of Using the Glass Balls in the Plating Barrel.

## Use of Glass Balls in the Plating Barrel.

The use of glass or porcelain balls in plating barrels, for the purpose of hardening and polishing the work while it is being plated, has been patented by Stefano Consigliere of Genoa, Italy (U. S. Patent, 1,051,556, Jan. 28, 1913). The process is applied more to the hardening of electrodeposits than of polishing them, for the reason, undoubtedly, that it is impossible to obtain a surface sufficiently smooth on the balls, when composed of glass porcelain or other non-metallic material, which will act in producing a surface polished equal to that given by steel balls in tumbling. It is probable, however, that the surface is improved and without a doubt, hardened.

The manner of performing the operation may be appreciated by inspection of the sketches shown herewith. The glass, porcelain or other material are round and as smooth



Sketch Showing Method of Using the Plating Barrel for Hollow Work.

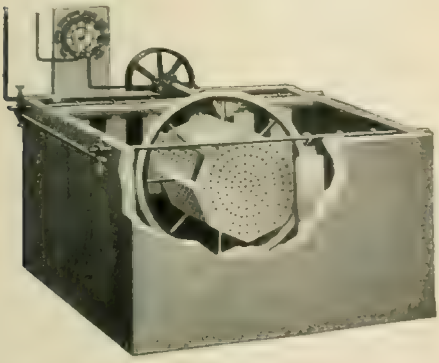
as possible, and are placed in the plating barrel with the work to be plated. The barrel is tumbled or rotated in the usual manner and the action of the balls on the electrodeposited surface serves to harden it.

In Fig. 2 is shown the manner of hardening the inside of an article, such as a tube, for example, that is being plated. The balls are not employed in this case, but discs are used instead and they are perforated so that they may be guided through the holes by a wire.

The process seems to be applicable to bodies of large size, rather than the usual kinds of small work plated in barrels.

## The "Excell-All" Mechanical Plating Barrel.

A new and novel form of mechanical plating barrel has been placed on the market by the Bennett-O'Connell Company, 3600 South Morgan St., Chicago, Ill., the well known manufacturers of electroplating and polishing supplies and equipment. This barrel is a radical change from any of the mechanical plating devices heretofore made. It is quite simply constructed and particularly easy to operate. The manner in which it is made may be appreciated by reference to the illustration of it herewith shown.



The "Excell-All" Mechanical Plating Barrel.

The barrel is rotated by means of a sheave or gear, which is driven by a belt from any convenient source of power. The barrel itself is suspended from this sheave and may easily be removed when a sufficiently thick deposit has been put on the work in it.

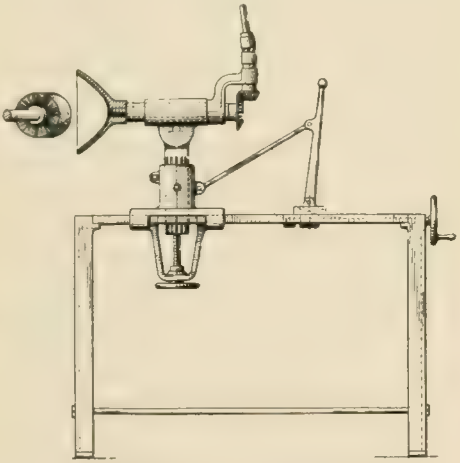
One of the great advantages of the barrel, the makers state, is the very large amount of work exposed to the anode surface, which they believe, is greater than has ever before been accomplished.

The barrel requires no special anodes and any shape or the regular flat anodes may be used. This feature renders the use of the barrel as simple as possible.

One of the attractive features of the barrel is the fact that a low voltage only is required to operate it and it may be run successfully with 6 volts. This means, of course, that any ordinary plating dynamo may be used and no special installation is required. The work is always in contact with the current connections and during a revolution of the barrel, it changes position eight times or sixteen times per minute. A uniform deposit, therefore, is obtained on all of the work irrespective of the length of time taken for the plating. The barrel is made in two sizes: 4 x 16 and 8 x 16 on the inside.

## A New Automatic Buffing Device.

A new automatic buffing device has been patented by Harry J. Webb of Detroit, Mich. It is used for buffing shells and similar work. The article to be buffed is held in a chuck that is movable in two directions, up and down. and is also revolved by means of bevel gears. The buff wheel remains stationary and the article in the chuck is fed up to it, while both the wheel and itself are revolving, by means of a hand lever and wheel. The machine illustrated shows the method oplied to the buffing of parabolic reflectors for automobile lamps.

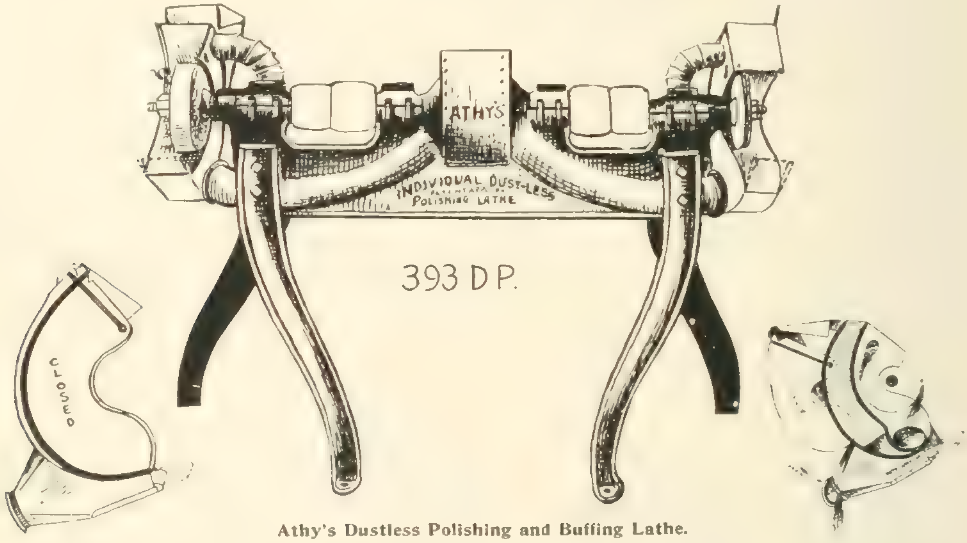


Buffing Machine for Reflectors.

## Athy's Dustless Polishing and Buffing Lathe.

A new form of polishing and buffing lathe has recently been placed on the market by the Dust Less Lathe & Supply Company, 2404 East 84th. St., Cleveland, Ohio, and of which C. F. Athy is the general-manager.

This machine is designed to run as a double polisher. Each of the two independent arbors has its own suction fan, permitting two workmen on the same machine to be independent of each other. One may stop to change his wheel or for any other purpose, while the other continues his work. This feature contributes to a great saving of time over the old single spindle.



Athy's Dustless Polishing and Buffing Lathe.

This machine is designed to collect its own dust thereby doing away with the need of a large fan and dust collecting system. It is built for polishing or buffing large work and is especially adapted for stove manufacturers. It is strongly constructed, spindles being made of Cumberland steel, turned, ground and running in nine inch babbitted bearings.

The hoods are specially constructed of iron and steel, adjustable to any size wheel from six to sixteen inches in diameter. The side door slides back automatically when the top of hood is lifted. The short pipe extending back is constructed so that if a piece of work should get caught or is dropped by the workman, it will fall to the floor, thus keeping it from getting caught in the fan and probably becoming lost.

## Why Hot Cyanide Copper Solutions Should be More Extensively Used.

If platers fully appreciated the advantages of a hot cyanide copper plating solution, it would be more extensively used than it is. In many instances it is absolutely necessary to use it, and in others, platers would find it far more advantageous and serviceable than the cold solution which they are now using. While the hot cyanide copper solution is not recommended in all cases, it should be used in many lines of work and the results will always be found to warrant it.

The advantage of a hot cyanide copper solution lies in the fact that it can be used comparatively weak and with very little free cyanide in it. The copper deposits rapidly and evenly and without blistering, and adheres well. It has another very satisfactory property of "throwing" and it will be found that little holes and deep ones too, will be well covered with copper; and in a manner that cannot be accomplished with a cold solution.

One of the great advantages of a hot cyanide copper solution is its freedom from blistering (provided, of course, it is made up as it should be) and in the plating of soft metals, such as antimonial-lead, spelter, die-castings, tin, etc. it is really the only solution which can be employed with success. Those who plate these materials regularly, use it.

Cold solutions are apt to blister and do not "throw" satisfactorily.

In the plating of cast-iron, hot cyanide copper solutions are particularly advantageous as they cover in a manner that cannot be obtained with cold baths except when very strong and used with a high current density. In plating steel, too, the hot solution is the most satisfactory as it will cover well and is not as apt to blister. The blistering of cyanide copper solutions on steel is a very common occurrence and its effect is not generally appreciated. It finally results in "spotting-out" and can be noticed on much of the steel plated work on the market.

In the use of hot cyanide copper solutions, they should be weak, not over 5° Beaumé and even less is often better and with not over one or two ounces of free cyanide to the gallon. The free cyanide can be kept down quite low in hot solutions, and blistering can be thus avoided. The temperature should not be too high. From 120° to 150° F. is about right.

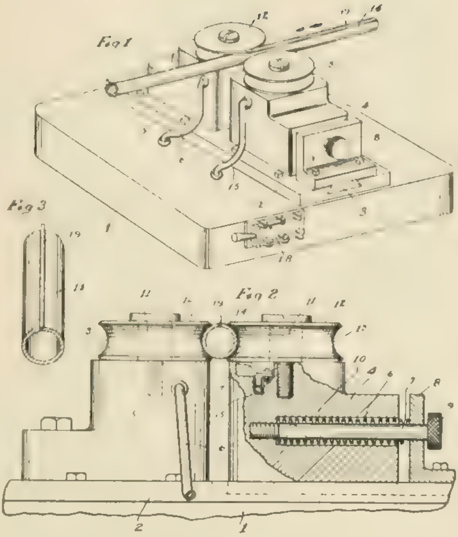
## Brazing Brass Tubing by Electricity.

The ordinary method of making brazed brass tubing is to form the tube from sheet and then apply brazing solder, mixed with borax for a flux, to the joint, place in a furnace and heat until the solder (usually half copper and half zinc) melts and brazes the seam together. The tube is then drawn to smooth it and remove the roughness of the brazed joint.

A new process of brazing the seam has recently been patented by Henry Higgin of the Higgin Mfg. Co. of Newport, Ky. in which use is made of the electric current for melting the solder.

The tube is fed between rollers as shown in the illustration and which press together the edges for brazing. This feature is intended to overcome the difficulty experienced in brazing tubing in the ordinary manner as the edges are apt to open unless firmly fastened. In regular brazing, iron wire is bound around the tube before it goes into the furnace in order to hold it in place.

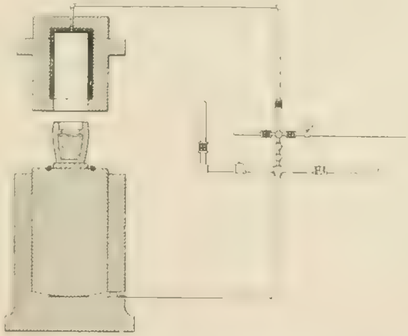
Before the tube is introduced between the rollers, a narrow strip of brazing solder is placed between the edges. This is shown by 19. If, however, the edges have been made with a V shaped cut, then grain solder may be used. The seam is placed uppermost. The current is now passed through the tube, and the heat at the joint serves to fuse the solder and produce a sound joint.



Method of Brazing Brass Tubing by Electricity.

## A Process of "Impregnating" Graphite with Metals.

According to a patent recently issued to Campbell Scott and William Deats of Yonkers, N. Y., it is possible to "impregnate" graphite or carbon with metals, or one metal with another. The method used is to be applied more particularly to impregnating carbon with metal, and is as follows:



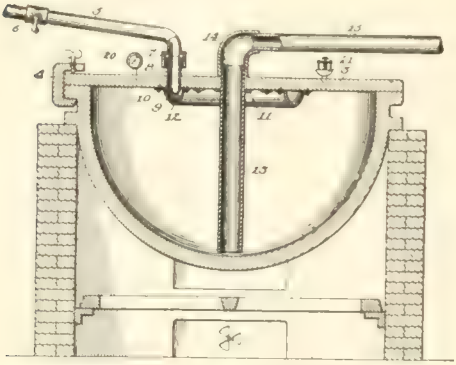
Manner of "Impregnating" Graphite or Carbon with Metals.

The carbon is placed in a crucible and molten metal poured on it. A cover is then placed over it and air pressure is put upon the crucible and the metal, it is stated, is forced into the pores of the carbon. The fact that air is on the inside and outside of the crucible prevents its breakage.

It is stated that graphite cores of lead pencils, when impregnated with lead, gives it greater durability and enables it to retain a point much better than the ordinary pencil. It is also stated that cast-iron may be impregnated with brass or babbitt-metal to form bearings.

## Using Steam for Casting Soft Metals.

A method of using steam for forcing soft metals out of the kettles in which they are melted, into molds has recently been patented by Grenville Mellen of Summit, N. J. (U. S. Patent, 1,053,948, Feb. 18, 1913). The method of doing it is as follows:



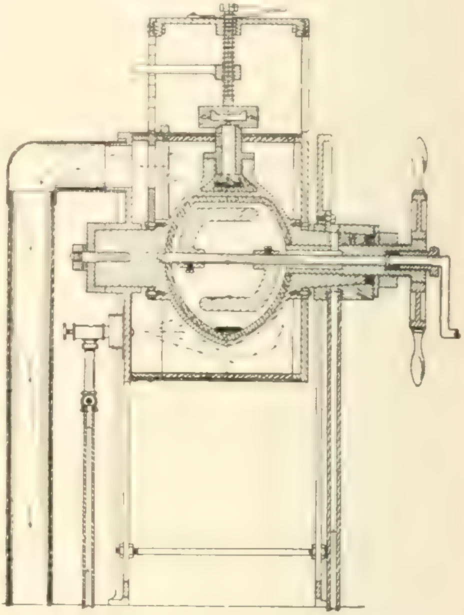
Mellen's Apparatus for Casting Soft Metals.

The soft metal, such as babbitt-metal, solder or other low melting material, is melted in a cast-iron kettle in the usual manner. This kettle, is provided with a cover through which an inlet and an outlet pipe penetrate. The whole is made air tight. The inlet pipe is used for the entrance of steam and the metal flows from the outlet pipe to the molds.

Steam is allowed to enter the pipe through the cover so that it comes in contact with the metal itself or the interior above it. The heat therein serves to superheat it and generate pressure on the metal. The pressure forces the liquid metal through the outlet pipe into the molds.

## An Improvement in Die Casting Machines.

Layton ,M. Parkhurst of Anderson, Ind., has patented a new form of die casting machine and which is herewith illustrated. The machine, like others of the same kind, is intended for the purpose of casting comparatively low melting metals in die molds



The "Parkhurst" Die Casting Machine.

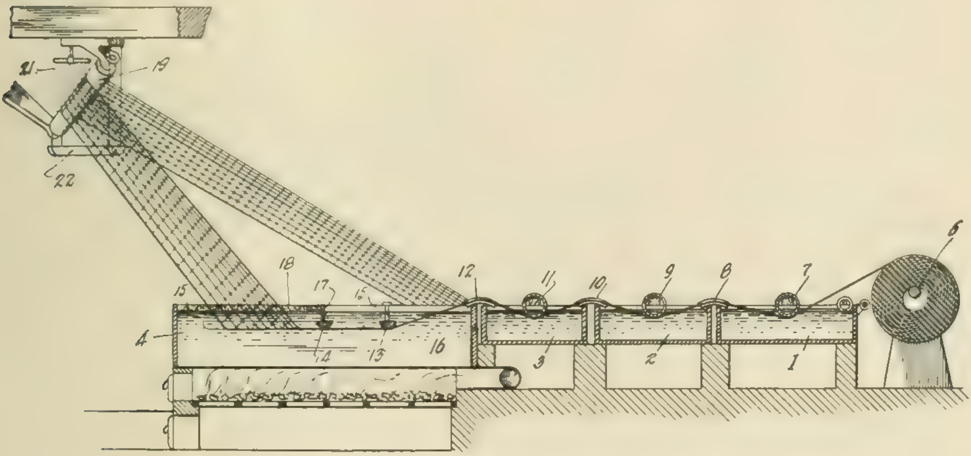
The novelty of the invention lies in the use of a revolving melting pot which, if necessary, may be lined with graphite. Pressure is applied to this pot by means of air in order to force the metal into the mold. Inside of the melting pot are two paddles for use in stirring the metal and maintaining it in a well mixed condition.

When the metal is melted, the melting pot, and the mold on top of it, are turned over and the pressure forces the metal into the mold. It is then turned back, the mold and casting removed, the casting taken out and the mold is then replaced for another casting.

Bronze powders are made by hammering thin sheet brass or bronze under steam hammers until the right degree of fineness has been obtained. The chief uses of bronze powders are in the manufacture of wall papers and in printing.

## A Modification in Galvanizing Wire Cloth and Netting.

A modification of the method of galvanizing wire cloth and netting has been patented by William H. Summer of Peoria, Ill. (U. S. Patent, 1,053,664, Feb. 18, 1913). The process is applied to the galvanizing of the cloth after weaving.



Improved Method of Galvanizing Wire Cloth.

The cloth passes from the roll 6 to the acid bath 1 and a "sinker" 7 keeps it under the surface. It then passes over a piece of vitrified tile 8 into the rinse tank of water 2. The acid or flux tank is shown by Fig. 3 after which the cloth passes to the spelter kettle 16. The cloth then passes to a reel 19 where it is cooled by water. Before it enters the overhead reel, however, it passes through a wiper 18.

The cloth, after it issues from the spelter, passes obliquely and stress is laid upon this method as it allows the strands of the cloth to be drawn up out of the spelter so that it will drain off readily. The use of this oblique method of removing the cloth from the spelter is, in reality, the novelty of the patent.

Blisters in sheet metals (which are not subject to the same kind of "spotting-out" as castings) are a very frequent source of spotting out. They enclose plating solution which gradually works out and spots the surface.

## A New Method for Soldering Aluminum.

A novel means for soldering aluminum has recently been invented and patented by Carl Eduard Steinweg of Lüdenscheid, Germany. Either pure aluminum or an alloy rich in aluminum is used for the solder and in connection with following flux:

| | |
|---|---|
| Cryolite .................. | 30 parts |
| Common Salt ............. | 35 parts |
| Potassium Chloride ........ | 35 parts |

The solder is made in the form of a tube or similar shape that is hollow, and the flux is placed inside of it. Various forms or shapes of tubes are used by the inventor, and inside is placed the flux so that the whole constitutes a soldering stick. When heated, it is claimed, the flux and solder both melt and drop upon the work. The flux drops first, and then the solder, effectually soldering the joint. The novelty of the invention lies in the use of the flux inside of the tube. The flux itself is not claimed in the patent specification.

Antimony is a very common impurity in soft solders as so much scrap tin and lead are used in making them that contamination takes place readily. A few per cent of antimony does not appreciably injure the solder, although it does not flow as readily as that made from new metals.

## Questions and Answers.

QUESTION No. 1260. We are having trouble in rolling our britannia-metal. We find that the edges split when the cast metal is rolled and it is our impression that it is caused by the tin burning out during the melting. Can you help us out of the difficulty?

*Answer.* Your difficulty has not been caused by the tin burning out of the metal, but from the fact that the metal was poured too hot. We assume, of course, that your mixture is correct, which it undoubtedly is as you have been making the metal right along. Metal which is poured too hot will crack in rolling. You will have to cool the metal down with scrap, if it is too hot, and pour it at as low a temperature as it is possible to obtain a good casting.

QUESTION No. 1261. What will be the effect of a nickel plating solution standing in a galvanized iron can? We have left our nickel solution in it and find that it does not give as good a deposit as before.

*Answer.* A nickel solution will attack the zinc on the galvanized can, and dissolve it. The solution will then contain zinc which produces a dark nickel deposit. You should keep your solutions out of galvanized iron vessels.

QUESTION No. 1264. What is the best material to be used for wire employed in the manufacture of fly-screens for withstanding the effects of salt air at the seashore? We have used bronze and copper but do not find it satisfactory.

*Answer.* The best material would be Monel-metal. This is an alloy of approximately 66% nickel and 34% copper. Another excellent material and one easier to draw into fine wire is the following:

| | |
|---|---|
| Copper | 80% |
| Nickel | 20% |

This is known as "cupro-nickel". There is also another mixture containing 85% copper and 15% nickel that is also good. The one containing the 20% nickel is preferred, however, as it is more non-corrosive. We do not advocate the use of German-silver wire which,. although non-corrosive, is apt to crystallize and break in service on account of the fact that it contains zinc.

QUESTION No. 1265. Can platinum be plated on to other metals as a commercial propostion like gold or silver? We have been informed that it cannot be done and that, while it can be plated, it is only a "smut".

*Answer.* Platinum can be plated as commercial proposition and by any one who has a knowledge of electroplating. It deposits as a good bright coating and is apparently equal to that of the rolled metal, as far as color and durability is concerned. The best solution is that known as "Roseleur's" phosphate bath and has been given in THE BRASS WORLD several times

QUESTION No. 1266. A lot of scrap metal has been melted and run into pigs and the analysis of it is as follows:

| | |
|---|---|
| Tin | 32.58% |
| Lead | 47.34% |
| Zinc | 6.04% |
| Antimony | 13.06% |
| Copper | 0.85% |

It is difficult, I think, to use this alloy to make a useful mixture of any kind on account of the large amount of antimony it contains. It can be made up into an acid resisting metal of the formula 80% copper, 10% tin, 5% lead and 3% zinc, but what effect will the 1.3% antimony have on it (this is the amount that will enter).

*Answer.* Your suggesion to use it for an acid metal is a good one, although it may be used for making a cheap composition. The small amount of antimony will not appreciably injure the metal and, in fact, antimony is now frequently used in amounts of one or two per cent in place of the same amount of tin. The metal is then cheapened. Antimony, however, will not injure the acid metal as it is itself quite non-corrosive in ordinary acids In the sulphite work, which we presume you intend it to be used, it will probably work beneficially rather than otherwise.

QUESTION No. 1267. Are the ordinary cast cooking utensils of aluminum, such as tea-kettles, cast in sand or metal molds?

*Answer.* These are always cast in sand as it is impossible to cast so thin and so large a shape in a metal mold. They are cast in the same manner as an iron tea-kettle.

QUESTION No. 1268. Can blowholes in iron castings be filled so that they can be nickel plated and not have the holes show? We have heard there is a filler for this purpose, but we have tried some of the materials used for filling the holes in iron castings but cannot nickel plate over them.

*Answer.* You cannot obtain any thing that will answer. The fillers for cast-iron are for painting over and not for nickel plating. If the metal were of anything except cast-iron, you could solder up the holes, but cast iron cannot be soldered very well.

QUESTION No. 1269. What is the effect of metallic sodium on metallic tin? Also method of introducing it. Also the effect of sodium or lead and the alloys of tin and lead.

*Answer.* Metallic sodium hardens both tin and lead without changing the color. In the case of lead, 2% of sodium will harden it so that it will ring when struck. A larger amount causes it to become brittle. The lead and sodium alloy is used for a bearing metal. The alloys of sodium and tin have no use as far as known. What the effect of sodium on the alloys of tin and lead is unknown although it undoubtedly will harden them in the same manner as it does the individual metals

One of the bad features of the alloys containing sodium is the fact that in damp air or in contact with water, they corrode rapidly and badly. The sodium changes to caustic soda which covers the metal with a liquid film.

Question No. 1270. We are desirous of obtaining the crystal finish on sheet tin plate, but have not been able to obtain it satisfactorily. While we can obtain good crystals, they are too large. What the trade wants are the small crystals and we cannot obtain them by any acid treatment. We have used sulphuric, hydrochloric acids alone and in combination, but without satisfaction. The crystals are always too large. We are unable to obtain the small crystals at all. In what manner can they be obtained?

*Answer.* Your difficulty is not in the acid but in the tin-plate itself. You cannot change the initial shape of the crystals on the tin-plate as these are formed when the tin cools on the surface after the sheet has been withdrawn from the molten tin. It is possible that if you try some other brand of tin-plate you may be able to obtain what you want in the size of the crystals. If the tin on the surface of the sheet iron is quickly cooled, when withdrawn from the tinning kettle, the crystals will be smaller than when slowly cooled. Slow cooling of molten metals always produces large crystals and rapid cooling small crystals.

Question No. 1271. Is there any method of removing the nitrates from a cyanide copper solution?

*Answer.* There is no practical method of removing nitrates from a cyanide copper solution. In fact, you cannot remove them without actually destroying the solution itself and in this case the copper would be all that is saved. It would not pay to do this as the cost would be more than that of a new solution. We presume you have contaminated your solution by using copper that has been dissolved in nitric acid for making the carbonate of copper. If you wash the carbonate well with hot water, so that most of the nitrate is washed out, it will be all right. A small quantity of nitrate in a cyanide of copper solution does not appear to be harmful.

Question No. 1272. It has lately come to our notice that tungsten can be alloyed with aluminum for the purpose of making aluminum sand castings, and that the tensile strength can be considerably increased thereby. Owing to the high melting point of tungsten, the alloying with the aluminum cannot be done without burning it out and practically destroying it. In what way can tungsten be introduced into the aluminum?

*Answer.* As tungsten has the highest melting point of any metal, you will probably be unable to alloy the two metals by simple melting. The method that has been used is to incorporate oxide of tungsten with the bath used for the reduction of the aluminum. The tungsten is reduced along with the aluminum, and the two metals thus become alloyed. Whether tungsten has a very beneficial effect on aluminum is apparently doubtful

Question No. 1273. We are silver plating automobile headlight reflectors and do not wish to have the silver deposit on the back. It is not only unnecessary to have the silver deposit on the back but wastes the silver How can we avoid it?

*Answer.* The method ordinarily used for stopping off the back of reflectors is by means of asphalt paint. This is cheap and efficient. Ordinary asphalt paint or varnish of commerce is used. Thin with turpentine so that it still flows well but is not so thin that it cannot be spread well with the brush. If used too thick it does not dry rapidly enough. It can be thinned with turpentine so that when painted on, it has a brown color rather than a black shade. It will form a sufficient resist then and dries rapidly. It is also readily removed if desired after plating. You probably will not have to remove the asphalt after plating the reflectors as it will not show after the lamp has been assembled, but if you do, you can use turpentine or kerosene oil for this purpose. It is easily removed by rubbing with a cloth soaked in either of these solvents.

Question No. 1274. We have experienced a little trouble with our castings after they have been galvanized. These castings are of gray-iron and are galvanized in hot spelter. In machining them, some of the zinc is removed or ground off which spoils the appearance. Is there a paint that can be used for painting over these bare parts and which will look like the galvanized surface?

*Answer.* Probably the well known aluminum paint of commerce will match the galvanizing as well as anything you can obtain, although powdered zinc can be obtained and if mixed with a little lacquer or thin varnish will, perhaps, match the shade of the galvanized surface a little better.

Question No. 1276. Some of our brass castings which we make for marine work, have holes in them. We fill up these holes with solder which makes them look dark. We have an iron cement which we use for cast-iron, and wish to know whether there is any similar material which we can use on the brass for filling up the holes instead of employing the solder?

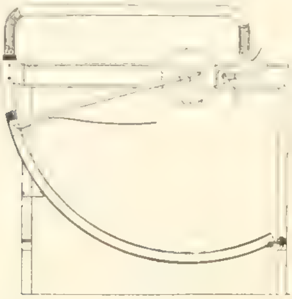
*Answer.* There is nothing that you can use for the purpose. There are various "dopes," made with brass or bronze powders which will fill up the holes, but they will not adhere. It will be like filling up the holes with putty. In the case of iron, the cements rust the iron in contact with them and this serves to bind it.

Question No. 1280. In using a silver dip for silver plating small brass goods, we find that the silver does not come out white, but is yellow and of poor appearance. How can this be avoided?

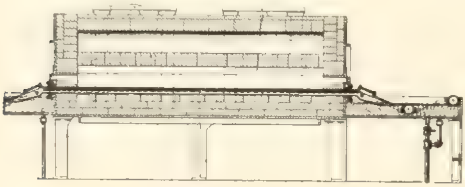
*Answer.* If you are using the regular silver dip made with silver chloride or nitrate and cyanide, then your trouble is caused by the use of too much cyanide. This will produce the yellow color. You should use only enough cyanide to dissolve the silver chloride or nitrate and no more.

# Patent Abstracts.

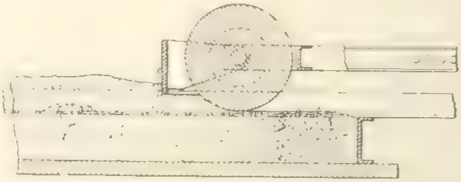
1,052,863, Feb. 11, 1913. APPARATUS FOR HEATING TUBES. Charles Vallone and Frank S. Rogers of Buffalo, N. Y. Assignors to the Barcalo Manufacturing Company of the same city. The apparatus is intended for heating brass or other metal tubing, used in bedsteads, for the purpose of lacquering. With the lacquer applied to brass beds, it is necessary to have the tubing heated in order to apply several coats. This apparatus is intended more particularly for use in heating bent tubing. The tube is held between two clamps and a coil inserted inside of it. This coil is heated by means of a coil of wire through which an electric current passes. In this manner the heat may be regulated as desired.



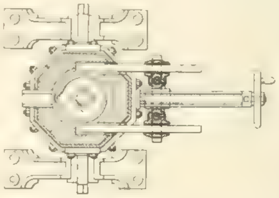
1,052,574, Feb. 11, 1913. NON-OXIDIZING ANNEALING FURNACE. Edward S. Davis of Jersey City, N. J. Assignor to the Rockwell Furnace Company of New York City. A furnace for annealing metals in a non-oxidizing atmosphere. This is accomplished by providing the annealing chamber with means for closing it to the heat products and also against the entrance of air or gas from the outside of the furnace. The annealing chamber is of tubular construction and extends the full length of the furnace. The ends are sealed by water and dip downward into it. The furnace is more particularly adapted for the annealing of wire and strip sheet metal.



1,052,004, Feb. 11, 1913. ROLL RAMMING APPARATUS. Harry P. McDonald of Montclair, N. J. Assignor to the Snead & Co. Iron Works of Jersey City, N. J. A method of ramming up sand molds for foundry use by means of rolling instead of ramming in the usual manner. A roll is passed over the sand in the flask and the pressure of which forces the sand down into the cavities of the pattern. Means are also used for striking off the top of the mold as the roller passes along the sand.

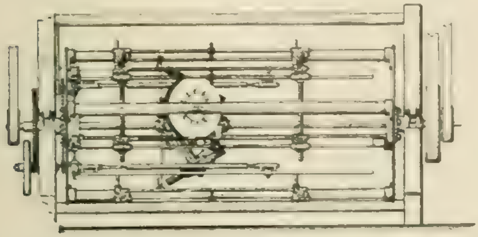


1,053,563, Feb. 18, 1913. ELECTRIC FURNACE. Jean Marie Bocuze of Lyon, France. An electric furnace for melting metal in crucibles. The arc method is employed and the arc itself is formed between two carbons above the crucible. The feature of the invention lies in the fact that the crucible can be rotated and moved up and down while the melting is taking place. This is necessary to obtain the necessary rapidity and economy in melting.



1,053,949, Feb. 19 1913. PROCESS FOR PREPARING MOLDS. William R. Conard of Burlington, N. J. Instead of ordinary foundry sand for making molds for foundry use, a mixture of pulverized foundry slag and hydraulic cement is used. One part of cement and two parts of slag are used. The two are mixed and then moistened with water and worked together like sand. The mass is then rammed up in the mold in the regular manner and dried before using. It is claimed that this mass may be used for casting brass, bronze, and babbitt-metals as well as iron and that very smooth work can be produced.

1,052,455, Feb. 11, 1913. POLISHING MACHINE. John C. Blevney of Newark, N. J. A machine for polishing and buffing tubes and similar articles. This is done automatically without the need of skilled labor. The tube or rod is fed into the machine and polishing or buffing wheels are applied to the surface. The tube of rod is then automatically fed along and the polishing or buffing is accomplished. Means are supplied for the delicate adjustment of the wheel so that the finish of the surface of the article being treated may be correspondingly adjusted, as the case may require.



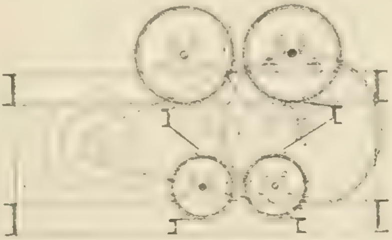
1,053,592, Feb. 18, 1913. PROCESS FOR CONDENSING METALLIC VAPORS. Frederick W. Gordon of Fort Washington, Pa. A method of condensing metallic vapors, particularly those of zinc. A specially constructed condenser is used through which the vapors are forced. This gas is maintained under pressure while passing through this conduit.

1,053,681, Feb. 18, 1913. MOLDING MACHINE. Henry Tscherning of Freeport, Ill. Assignor to the Arcade Mfg. Co. of the same place. A molding machine for making green sand molds in which the sand is elevated and dropped on the mold. Air pressure is also used for assisting in forcing the sand into the mold.

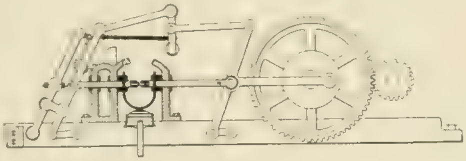
1,051,999, Feb. 4, 1913. MOLDING MACHINE. Alva D. Ineson and Philip C. Smith of Easton, Pa. A jarring molding machine for use in making green sand molds. The machine is operated by compressed air, and springs, levers, weights, rods, etc., are dispensed with on this account. The simplification of the machine is the novelty.

1,052,514, Feb. 11, 1913. TREATMENT OF FOUNDRY SAND. Andrew Poulson of Farnsworth, England. Old foundry sand, both mold and core sand, is treated with sulphate of aluminum and silicate of soda (water glass) in order to render it suitable for use again

1,053,908, METHOD OF PREPARING TINNED SHEET IRON BOXES ETC. FOR DETINNING. Hans Goldschmidt of Essen-on-the-Ruhr, Germany. Assignor to the Goldschmidt Detinning Company of New York, N. Y. A method of preparing tin cans etc. for detinning. The object is to perforate the tin and expose as much surface as possible to the action of the detinning substance. The cans are fed to rollers which flatten and perforate them.



1,052,651, Feb. 11, 1913. DISK CASTING MACHINE. Eduardo Casteneda of Monterey, Mexico. A machine for casting lead car seals. The machine comprises a melting pot and the mold is carried through the sides of this pot into the lead. It is then removed and the lead will be found to fill the mold. It is then separated and the lead seal drops out. These operations are done automatically.



1,052,081, Feb. 4, 1913. MANUFACTURE OF HANDLES OF PLASTIC MATERIAL. Ernest Miltner of Newark, N. J. Assignor to the Rubber & Celluloid Harness Trimming Co. of the same city. A tube of celluloid is placed in a mold and steam admitted to the inside of it. The celluloid is thus expanded into the recesses of the mold and articles of various designs may thus be produced.

1,052,482, Feb. 11, 1913. MOLDER'S STAMPING TOOL. Georg Holzapfel of Essen-on-the-Ruhr, Germany. A power rammer for ramming green sand molds in the foundry. The novelty of the invention lies in the fact that the rammer is adjustable as to length and may be used for shallow or deep molds as may be desired. The rammer is operated by compressed air.

## Trade Items.

The electroplating plant of the [illegible] Steel & [illegible] Co. of [illegible], Mass., is [illegible] enlarged and plating barrels will be installed.

The Globe Art Mfg. Co. of Newark, N. J., manufacturers of [illegible], are [illegible] to build a new three story brick plant in that city It will be situated at 45 Winthrop St., and will be [illegible].

The [illegible] Corset Company, [illegible] Ave., Bridgeport, Conn., are about to equip their factory with an electroplating plant. They manufacture a corset steel from woven wire and in order to prevent it from rusting it is necessary to electro-galvanize it. Heretofore, they have had their electrogalvanizing done outside, but will now do it themselves.

At the meeting of the board of directors of the Detroit Copper & Brass Rolling Mills, held on January [illegible], the following officers were elected: Lewis H. Jones, president and general manager; Richard P. Joy, vice president; John R. Searles, assistant general-manager; Frank H. Hoffman, assistant general manager; Andrew J. Peoples, secretary and treasurer; Wallace P. [illegible], assistant secretary and treasurer, and J. Ernest Workman, auditor. William F. Montgomery has retired from the executive staff on account of ill health.

A large aluminum foundry is to be started at [illegible], Wis., by Conrad Werra and Max Pankratz of Manitowoc, Wis., and the Werra Aluminum Company has been organized with a capital stock of [illegible] for this purpose. The shops formerly occupied by the Wisconsin Central R. R. have been obtained and will be converted for the foundry. Mr. Werra established the foundry at Manitowoc, Wis., fourteen years ago and which is now one of the plants of the Aluminum Castings Co. It is stated that the new works will have three times the capacity of the Manitowoc foundry.

The Fourth Annual Banquet of the National Electroplaters' Association was held at the Broadway Central Hotel, New York City, on the evening of February 21st and was, undoubtedly, the most successful yet held. The interest displayed in the Association is evidenced by the fact that [illegible] members were present. Addresses were made by George F. Kunz, vice-president of Tiffany & Co., New York City, Prof. Joseph W. Richards of Lehigh University and H. B. [illegible] of the United Lead Company, New York City. Dr. William A. Jones, general-manager of the Celluloid Zapon Company, acted as toastmaster. The chairman of the Banquet Committee was Thomas Haddow and to this committee is due much credit for the able manner in which the affair was conducted. The educational feature of the Association has appealed to manufacturers, many of whom sent their platers to the Banquet

Owing to the death of J. A. Bradford, the plant and business of the [illegible] Brass Works at [illegible], N. [illegible], is to be sold.

The plating and coloring plant of John P. [illegible] & Son, [illegible] Attleboro, Mass., has been extended by the installation of two new [illegible].

Adams & Hollopeter, 745 Mission St., San Francisco, Cal. and Fowler Mallet, 353 Sutter St., have consolidated under the name of Adams, Hollopeter and Mallett. No change in the personel of the firms will be made. The manufacture of lighting fixtures is carried on.

The Munning-Loeb Company, Matawan, N. J., have recently issued a treatise on buffs which contains information not heretofore published. This catalogue will be found of exceptional interest and will be sent to the trade upon request.

The Roessler & Haaslacher Chemical Co., 100 William St., New York City, manufacturers of chemicals, are sending out to the trade the third edition of their booklet on "Trisalyt." This treatise on electroplating has already met with the approval of the trade and contains much useful information. In it the method of using "Trisalyt" for making up all kinds of plating solutions is given. The booklet will be sent to those who desire it

The care with which the manganese bronze metal is made at the works of the Lumen Bearing Company at Buffalo, N. Y. and Toronto, Canada, is evidenced by the fact that it is constantly under the supervision of an experienced metallurgist. It is possible to obtain from [illegible] to [illegible] lbs. tensile strength and 25% to 30% elongation. This is known as their "L. B." grade. A booklet will be sent upon request in which this bronze is described. This company also make manganese-bronze castings with the above physical qualities. In addition to manganese-bronze, standard red brass mixtures are carried in stock and they can ship in car-load or less lots to any desired analysis. They desire the opportunity to quote on red-brass specifications.

The H. S. Wyckoff Co., 60 Arlington St., Newark, N. J., manufacture all kinds of polishing and buffing compositions for the plating and plating trades. Inasmuch as they manufacture these materials themselves under the personal supervision of Mr. Wyckoff, who has had long experience in the plating supply business, customers will be certain to obtain only the highest grade of compositions. This company also handle a full line of polishing and plating equipment and supplies, such as tanks, dynamos, buffs, polishing lathes, anodes, etc. Only the best classes of these appliances are handled. The opportunity to quote upon anything used in the plating and polishing trade is solicited and estimates and prices will cheerfully be given

The Harrison Mfg. Co. of Lockport, N. Y. recently increased their capital stock to $200,000 and have leased a large plant at Elm and Erie R. R. where the manufacture of automobile radiators will be carried on.

The Edwards & Smith Company, 15th. & Washington Sts., Philadelphia, Pa., brass, bronze and aluminum founders, have moved to Easton, Pa. where the plant formerly occupied by the Easton Glass Company has been obtained. The capacity of the plant will shortly be doubled.

In the statement made to the Tariff Inquiry Commission, on January 15th, Arthur Davis, president of the Aluminum Company of America, admitted that his company was the only concern making pure aluminum in the United States. It was also said that his company owned the Canadian Aluminum Company which, in turn, had agreements with all the foreign companies. This agreement, Mr. Davis stated, covered the whole world with the exception of the United States. In this country it would not comply with the law.

The capital stock of the Hamilton Watch Company of Lancaster, Pa. has been increased from $1,000,000 to $2,000,000 and the capacity of the plant will be increased from 350 to 450 watches per day. At the meeting of the stockholders, at which this increase was voted, the following officers and directors were elected: President, Charles F. Miller; vice-president, P. T. Watt; treasurer, J. W. B. Bausman; and secretary, F. C. Beckwith. Directors: Charles F. Miller, J. W. B. Bausman, George E. Fahys, J. Fred Sener and P. T. Watt.

The American Metal Market Company of 81 Fulton Street, New York City, has sent out to the trade copies of their 1913 issue of "Metal Statistics". This is the sixth annual edition. The book is edited by B. E. V. Luty and C. S. J. Trench. In it the prices and other statistics of all the common metals for the past ten years are given. This book contains information which cannot be obtained elsewhere. It is bound in cloth and contains statistics which cannot otherwise be located. It is bound in cloth and contains 255 pages.

The W. S. Rockwell Company, 50 Church St., New York City, the well known furnace designers and builders, are now building a new type of "Semi-Producer" furnaces which will, it is believed, solve to a great extent, the fuel question. Where the price of oil is prohibitive, these furnaces offer the logical solution of the problem. Cheap coal fuel is employed for producing the gas used for the heating. What this company has done, is to combine the furnace and gas producer so that a simple, self-contained appliance is had. All the advantages of the hot gas fuel is obtained without its disadvantages when produced in the ordinary way. The W. S. Rockwell Company will be pleased to supply printed matter fully describing these types of furnaces.

The Ohio Brass & Copper Co., of Cincinnati, Ohio, are to move their plant to 412 Elm St. and will add equipment to the plant which will increase their capacity to a considerable extent.

The Haydenville Company of Haydenville, Mass., manufacturers of plumbers' brass goods, which recently purchased the plant and business of the Bay State Brass Company of the same place, announce that the latter company will shortly go out of business.

John H. Burns Jr., who for a number of years had charge of the purchasing department of Dodge Bros. of Detroit, Mich. has now become associated with I. M. Jacobson & Sons of Detroit, manufacturers and smelters of all kinds of metals and alloys and will devote his entire attention to their business. This company are now operating their new smelting works at 70-72 Catherine St.

The White Adding Machine Company has been incorporated in New Haven, Conn. with a capital stock of $1,000,000 to take over the business of the Connecticut Computing Machine Company of that city. The factory of the latter company will be occupied for the manufacture of the machines. The incorporators of the new company are Max Adler, Roger P. Tyler, E. S. Swift, R. S. Woodruff, former Governor of Connecticut, and Charles Wales. The company has been incorporated under the laws of Tennessee.

The next Convention of the American Foundrymens' Association, the American Institute of Metals, and the Foundry & Machine Exhibition Company will be held in Chicago on October 10th. to 17th. It is expected that it will be the largest convention yet held and the exhibition will be far more extensive than ever, if the plans already laid are carried out. The exhibit will be held in the great Internotional Amphitheatre Building which it is stated affords accomodations unsurpassed in any city in the United States. Carload shipments can be switched right into the building, and every facility will be had for working the exhibits.

The new factory of the Stamford German Silver Company at Springdale, Conn., a suburb of Stamford, Conn., is now completed and manufacturing has commenced. The manufacture of high grade German-silver sheet, rod and wire will be carried on, and also the production of nickel anodes. The manufacture of the anodes has already been commenced and a high grade product only will be turned out. The officers and employees of the company are all men of long experience in the manufacture of German-silver and this fact insures customers that the very highest class of German-silver and nickel alloys only will be produced. A specialty will be made of German-silver for the manufacture of flatware and resistance wire. Although the factory of the company is in Springdale, a suburb of Stamford, Conn., the post-office address is at the latter city

The Chapman Specialty Company has been incorporated in Canton, Ohio and will manufacture radiator valves. The capital stock is $10,000 and among the incorporators are S. Dewitt Chapman and E. H. Lamiell.

The Display Fixture, Inc. has been organized in Rochester, N. Y. with a capital stock of $25,000, to manufacture window display fixtures. The directors are J. R. English, W. B. Bruce and J. A. Nolan, all of Rochester.

Leitelt Bros., 6338 Madison Ave., Chicago, Ill. have been incorporated with a capital stock of $10,000 to make brass and bronze castings. Edward Leitelt, Matthew J. Hevenor and Charles F. Leitelt are the incorporators of the company.

The Connecticut Silver Plate Company has been organized in Bridgeport, Conn. with a capital stock of $50,000 for the manufacture of art metal novelties. The new company takes over the plant and business of the Macfarlane Bros. Mfg. Co., Ash and State Sts., Bridgeport, Conn. which have manufactured the same line of work. Behrend & Rothschild of New York City, jobbers in novelties, are interested in the new company.

The plant and business of the Rogers Screw Company of Providence, R. I., manufacturers of wood screws, has been purchased by the American Screw Company of that city, manufacturers of the same line of goods. The plant will be operated under the name of the "Rogers Mills." The Rogers Screw Company was started in 1889 and the capital stock of the company is $250,000. Henry R. Rogers will remain as superintendent of the plant.

The Simmons Mfg. Co. of Kenosha, Wis., the largest manufacturers of brass bedsteads in the United States, are to spend approximately $100,000 for promoting the safety and efficiency of their employees. A prize of $2,500 will be divided among two foreman who show the greatest efficiency for the year 1913. A board of efficiency has been selected from the factory superintendents and foreman, with general superintendent Rudd as chairman, who will have charge of the distribution of the fund. Various experts from outside have been retained in connection with this new departure.

At the recent meeting of the stockholders of the American Brass Company of Waterbury, Conn., the following officers were elected for the coming year: President, Charles F. Brooker; vice-presidents, Edward L. Frisbie, Alfred A. Cowles, Thomas B. Kent, and John A. Coe Jr.; treasurer, John P. Elton; assistant treasurer, George E. Cole; secretary, Gordon W. Burnham; assistant secretary, Franklin W. Weaver. The directors elected are: Charles F. Brooker, James S. Elton, Alfred A. Cowles, Arthur C. James, Gordon W. Burnham, John J. Sinclair, Edward Holbrook, Edward L. Frisbie, John P. Elton, Cleveland H. Dodge, Thomas B. Kent, T. Brownell Burnham, John E. Wayland, James A. Doughty and John A. Coe, Jr.

Segelbohm & Company, jobbing electroplaters, have moved from 45 Maiden Lane New York City, to 17 John St.

The National Brass Company, Ltd., has been incorporated in London, Ont. Canada with a capital stock of $40,000 and will erect a plant for the manufacture of plumbers' brass goods. John F. Grant and Charles F. Ivey are among the directors of the company.

John M. Sherrerd of Easton, Pa., the well known steel expert and for 18 years with the Taylor Iron and Steel Company of High Bridge, N. J., is now connected with the Titanium Alloy Company of Niagara Falls, N. Y.

The Carboy Inclinator Company, 1269 Broadway, New York City, have recently placed on the market a new appliance for use in tilting acid carboys. The appliance is intended to render it an easy matter to tilt a carboy for pouring without spilling the acid.

The W. S. Rockwell Company, 50 Church St., New York City, are sending out to the trade, their Catalogue No. 44 on the subject of the "Rockwell Tilting Crucible Furnaces". These furnaces are used for melting brass, bronze aluminum and all copper alloys. This catalogue will be sent to those interested.

The Sherman Mfg. Co. of Detroit, Mich. are sending out to the trade their new catalogue of the "Sherman Equal Heat Gas Burner". This burner is designed to produce an even, uniform heat and is of novel construction. The office of the company is at Iroquois and St. Paul Ave.

The Garford Engineering Company has been organized in Elyria, Ohio, with a capital stock of $100,000, to manufacture aluminum under a new process. A. L. Garford, formerly president of the Garford Automobile Co. is the head of the company. It stated that the plant for the production of the aluminum will probably be established in Toledo, Ohio.

The Abbott Ball Company, Elmwood, Hartford, Conn., manufacturers of steel balls for burnishing and barrels for use with them, have issued a new folder describing the various articles that can be burnished by means of steel balls. The folder also contains a large number of testimonials in praise of the Abbott balls and barrels. The folder will be sent to those interested.

At the meeting of the stockholders of the William B. Durgin Company of Concord, N. H., held on Feb. 24th., the following officers and directors were elected: President, Barton P. Jenks; treasurer, John P. Abbott; and clerk, Frank S. Streeter. The directors are: Edward Holbrook of New York City. John S. Holbrook, F. C. Lawton of Providence, R. I., and Benjamin A. Kimball, Frank S. Streeter, Barton P. Jenks and John B. Abbott of Concord, N. H. Edward Holbrook, John S. Holbrook and F. C. Lawton are connected with the Gorham Mfg. Co. of Providence, R. I.

A new brass and iron foundry has been started by the American Roraty Valve Company at Anderson, Ind.

The Kimball Electric Co., Chicago, Ill., manufacturers of railway supplies and valves, recently incorporated their company with a capital stock of $1,250,000.

The wire goods business of Julian F. Bigelow of Worcester, Mass. has been purchased by the Spencer Wire Company of that city, manufacturers of wire and wire goods.

An addition to the plant of the Fiat Automobile Co. of Poughkeepsie, N. Y. is now being made and which will give them 30,000 additional feet of floor space.

A new foundry is to be erected by the United States Brass & Iron Company at Flint, Mich. The foundry building will be 75 x 200 feet.

The capital stock of the United States Graphite Company of Saginaw, Mich. has been increased from $500,000 to $750,000. Graphite paint is manufactured by the company.

The Alberger Pump & Condenser Company of Newburgh, N. Y., are obtaining estimates for the erection of an addition to their plant in that city. This addition will be 53 x 165 feet. This company is now operating a brass foundry for making their own brass and bronze castings.

The Jeffrey-Dewitt Co. of Detroit, Mich., manufacturers of spark plugs and automobile accessories are to build an addition to their factory which will give them 6,000 additional feet of floor space. The original factory will be devoted to the manufacture of the porcelain parts of the plugs.

The Standard Aluminum Company of Two Rivers, Wis., manufacturers of aluminum goods, are contemplating the erection of a rolling mill for rolling aluminum sheet. This company will, it is stated, import the aluminum from France. The manufacture of sheet aluminum stampings and pressed work is carried on.

The Yawman & Erbe Company of Rochester, N. Y., manufacturers of metal and wood filing cabinets and office furniutre, are receiving bids for the erection of an addition to their plant at Gates, N. Y. The new building to be erected will be 84 x 360 feet and a wing 84 x 250 feet and three stories high. The estimated cost of these additions is $200,000.

The Doehler Die Casting Company, Court and Ninth Sts., Brooklyn, N. Y., have recently succeeded in making aluminum castings in die molds and which have the properties of other die castings in that they are accurate and require no machining. These castings are made under pressure and it is claimed that they are superior to sand castings in closeness of grain and strength. At the present time, these castings are limited to comparatively small articles, but there are undoubtedly a large number of uses for them in the trade.

The Newell Brass Foundry at Central Falls, R. I. are replacing some of their old buildings by a new and larger single building.

The contract has been awarded for the new plant of the Aluminum Products Company at Joliet, Ill. This will be 56 x 200 feet.

A new brass foundry at an estimated cost of $25,000 is to be erected by the Bateman Mfg. Co., of Grenloch, N. J.

The A. & Z. Chain Company of Providence, R. I., manufacturers of jewelry, have added a new coloring department to their plant.

The Beardsley Chandelier Company, 225 South Clinton St., Chicago, Ill. have let a contract for the erection of a new plant for manufacturing.

The Charles Birdoux Machine Co. has been incorporated at 314 North May St., Chicago, Ill. with a capital stock of $10,000 to manufacture sewing machines.

The Universal Battery Company has been organized at 69 West Washington St., Chicago, Ill. and with a capital stock of $25,000. Electrical instruments and appliances will be manufactured.

The Rochester Brass & Aluminum Company of Rochester, N. Y., has purchased property on Marietta St. and will erect a foundry and machine shop on it. The machine shop will be two stories high.

A factory is to be erected by the Medicine Hat Pump & Brass Manufacturing Company of Medicine Hat, Alberta, Canada. Pumps and brass goods are to be manufactured and the plant to be established will cost $50,000.

The Zucker & Levett & Loeb Company, manufacturers of plating and polishing supplies and equipment, have moved their office to 95 Madison Ave. New York City. Their works still remain in the Bush Terminal Bldg. No. 1, Brooklyn, N. Y.

The Galion Brass & Bronze Company has been incorporated in Galion, Ohio, with a capital stock of $75,000. A general brass foundry business will be carried on. The incorporators are C. J. Rath, B. L. Stiles and A. G. Brown.

Charles Brady of Cleveland, Ohio, has been made general manager of the Aluminum Castings Company of Manitowoc, Wis. and has succeeded Conrad Werra. Mr. Werra recently resigned to organize the Werra Aluminum Co. of Waukesha, Wis.

The John J. Jackson Company of Newark, N. J., manufacturers of rolled silver and gold anodes, sterling silver sheet and wire, are erecting a new factory at 156 Astor St. New rolls will be installed in the new factory to take care of their increasing business.

Brass founders and galvanizers will find the spelter made by Joseph G. Kessler, 269 Russell St., Brooklyn, N. Y. of high quality and exceptionally suitable for their work. Those who use this material will find it to their advantage to obtain his prices. Correspondence is desired and will be cheerfully answered.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98-99% | ℔ | .22 |
| Acid, Acetic, pure, 30% | ℔ | .07 |
| Acid, Arsenious (White Arsenic) | ℔ | .20 |
| Acid, Benzoic | ℔. | .55 |
| Acid, Boracic (Boric), pure | ℔ | 12 |
| Acid, Hydrochloric, see Acid, Muriatic. | | |
| Acid, Hydrofluoric, 30% | ℔. | .04 |
| Acid, Hydrofluoric, 50% | ℔ | .10 |
| Acid, Muriatic, 20° | ℔. | .02 |
| Acid, Muriatic, c. p., 20° | ℔. | .07 |
| Acid, Nitric, 38° | ℔. | .05⅝ |
| Acid, Nitric, 40° | ℔. | .05⅞ |
| Acid, Nitric, 42° | ℔. | .06¼ |
| Acid, Nitric, c. p., | ℔. | .08 |
| Acid, Sulphuric, 66° | ℔ | .01¾ |
| Acid, Sulphuric, c. p. | ℔. | .06 |
| Alcohol, Wood | gal. | .50 |
| Alcohol, Denatured | gal. | .55 |
| Alum | ℔. | .04 |
| Aluminum, Metallic, in Ingots | ℔. | .26½ |
| Ammonium Sulphate | ℔. | .07 |
| Aqua-Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | ℔. | .04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | ℔. | .06¼ |
| Ammonia Water, c. p. | ℔ | .08 |
| Ammonium Carbonate, lump | ℔. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | ℔. | .12 |
| Ammonium Hydrosulphuret | ℔ | .30 |
| Ammonium Sulphate | ℔ | .07 |
| Ammonium Suphocyanate | ℔. | .50 |
| Amyl Acetate | gal | 3.60 |
| Antimony | ℔ | .09¼ |
| Arsenic, Metallic | ℔. | .10 |
| Arsenic, White (Acid Arsenious) | ℔. | .20 |
| Argols, White (Cream of Tartar) | ℔. | .31 |
| Asphaltum, Commercial | ℔. | .05 |
| Asphaltum, Egyptian (Bitumen) | ℔. | .30 |
| Benzine | gal. | .15 |
| Benzol, Pure | gal. | .60 |
| Bismuth, Metallic | ℔ | 2.25 |
| Bitumen, see Asphaltum. | | |
| Blue-Vitrol, see Copper Sulphate. | | |
| Borax, Crystals or Powdered | ℔ | .10 |
| Borax Glass | ℔. | 36 |
| Cadmium, Metallic | ℔. | .85 |
| Carbon Bisulphide | ℔. | .10 |
| Calcium Carbonate (Precipitated Chalk) | ℔. | .10 |
| Chrome-Green | ℔. | .50 |
| Copper, Lake, (carload) | ℔. | .15 |
| Copper, Lake, (case) | ℔. | .15¼ |
| Copper, Electrolytic, (case) | ℔. | .15⅛ |
| Copper, Electrolytic, (carload) | ℔. | .14⅞ |
| Copper, Casting, (carload) | ℔. | .14¾ |
| Copper, Casting, (case) | ℔. | .15 |
| Copper Acetate (Verdigris) | ℔. | .35 |
| Copper Carbonate, dry | ℔. | .25 |
| Copper Sulphate (Blue-Stone) | ℔ | .09 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | ℔ | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | ℔ | .16 |
| Emery Flour | ℔. | .04 |
| Emery, F F & F F F | ℔. | .03 |
| Flint, powdered | ℔. | .01 |
| Flour-Spar | ℔. | .01¼ |
| Fusel-Oil | gal | 3.50 |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | ℔. | .30 |
| Gum Guiacum | ℔. | .26 |
| Gum Mastic | ℔. | .70 |
| Gum Sandarac | ℔. | .35 |
| Gum Shellac, brown | ℔. | .50 |
| Gum Shellac, white | ℔. | .60 |
| Iridium | oz | 83.00 |
| Iron Perchloride | ℔. | .25 |
| Iron Sulphate (Copperas) | ℔. | .05 |
| Lead Acetate (Sugar of Lead) | ℔. | .15 |
| Lead, Pig | ℔ | .04⅜ |
| Lead, Red | ℔ | .12 |
| Lead, Yellow Oxide (Litharge) | ℔. | .12 |
| Liver of Sulphur, see Potassium Sulphide. | | |
| Manganese, Ferro, 80% | ℔ | .10 |
| Manganese, Metallic, pure | ℔. | .75 |
| Magnesium, Metallic | ℔. | 1.60 |
| Mercury Bichloride (Corrosive Sublimate) | ℔. | 1.16 |
| Mercury, Metallic (Quicksilver) | ℔. | .40 |
| Mercury Nitrate | ℔. | 1.50 |
| Mercury Oxide, yellow | ℔. | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | ℔. | .08 |
| Nickel Carbonate, dry | ℔. | .60 |
| Nickel Chloride | ℔. | .50 |
| Nickel Metallic | ℔. | .45 |
| Nickel Sulphate (Single Salts) | ℔. | .12 |
| Nitre (Saltpetre), see Potassium Nitrate | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Paraffine | ℔. | .15 |
| Phosphorus, yellow | ℔. | .40 |
| Phosphorus, red | ℔. | 1.10 |
| Pitch | ℔. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Chloride | oz. | 46.00 |
| Platinum Metallic | oz. | 48.00 |
| Potash by Alcohol, in sticks | ℔. | .50 |
| Potash, Caustic | ℔. | .05½ |
| Potassium Bichromate | ℔. | .14 |
| Potassium Bitartarate (Cream of Tartar) | ℔. | .31 |
| Potassium Carbonate (Pearlash) | ℔. | .10 |
| Potassium Chlorate | ℔. | .15 |
| Potassium Cyanide | ℔. | .25 |
| Potassium Iodide | ℔. | 2.25 |
| Potassium Nitrate (Nitre or Saltpetre) | ℔. | .10 |
| Potassium Permangarate | ℔. | .17 |
| Potassium, Red Prussiate | ℔. | .60 |
| Potassium, Yellow Prussiate | ℔. | .24 |
| Potassium Sulphide (Liver of Sulphur) | ℔. | .15 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | ℔. | .70 |
| Pumice, Ground | ℔. | .05 |
| Quartz, Powdered | ℔. | .01 |
| Rosin, Yellow | ℔ | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .59⅝ |
| Silver Nitrate, crystals | oz. | .50 |
| Soda-Ash | ℔. | .05 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | ℔. | .15 |
| Sodium Carbonate (Sal-Soda), crystals | ℔. | .02 |
| Sodium Hydrate (Caustic Soda) | ℔. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | ℔. | .45 |
| Sodium Hyposulphite ("Hypo") | ℔. | .04 |
| Sodium Metallic | ℔. | .90 |
| Sodium Nitrate | ℔. | .05 |
| Sodium Phosphate | ℔. | .09 |
| Sodium Silicate (Water-Glass) | ℔. | .04 |
| Soot, Calcined | ℔ | .15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | ℔. | .05 |
| Tin Chloride | ℔. | .43 |
| Tin, Metallic | ℔. | .48 |
| Turpentine, Venice | ℔. | .36 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal | .15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | ℔. | .45 |
| Wax, Carnauba | ℔. | .70 |
| Whiting (Ground Chalk) | ℔. | .02 |
| Zinc, Carbonate, dry | ℔. | .19 |
| Zinc, Chloride | ℔. | .12 |
| Zinc, Sulphate | ℔. | .06 |
| Zinc (Spelter) | ℔ | .06½ |

# THE BRASS WORLD AND PLATERS' GUIDE

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## Season-Cracking of Sheet Brass Goods.

The season-cracking of goods made of sheet brass has always been the most annoying, and at the same time, the most mysterious and perplexing of any of the ills to which brass is subject. The most exasperating difficulty is that which cannot be explained or one for which there appears to be no cause.

Season-cracking in brass always occurs in the metal that has been mechanically worked, such as the sheet, wire, rod or tubing, or goods made from them. Cast metal does not appear to be subject to it.

Brass season-cracks in this way: An article made of brass is put in use and for a time shows no indication of cracking. This time will vary, and may be a few weeks, months or years, depending upon conditions. It is usually a comparatively long time, a year or more, before the cracking takes place for the reason that if it were to show in a shorter time, it would be very likely to be noticed in the factory or in the dealers store or warehouse. This elapse of time before the cracking begins to appear renders the problem all the more perplexing. Finally small cracks appear and they gradually grow larger until, perhaps the article is completely filled with them and the brass springs apart.

Season-cracking may be explained in the case of an automobile lamp, which is made of drawn brass sheet, and frequently will show this phenomenon. The lamp, after it has been in use for some time, will begin to crack and gradually spring apart. Various forms of other sheet brass articles are often found cracked in the same manner.

Manufacturers of sheet brass goods which show the season-cracking difficulty are apt to throw the blame upon the maker of the sheet brass; but as far as known, both from investigations and experience, he is wholly guiltless and the cause of the phenomenon cannot be laid at his door. The cause of the cracking, in nearly every instance, is the manufacturer of sheet metal goods.

It has already been proved, without a doubt, that the cause of the season-cracking of sheet brass goods is the manner in which they were made. This assertion may appear ridiculous, but it is, nevertheless, quite true. Brass goods are now made, in the majority of instances, by press work and the sheet metal is drawn up to the required shape by this useful machine. It is in the actual drawing operation that the cause of season-cracks exists, and to sift the matter down still finer, in the actual shape of the die and punch.

Why the press work is the cause of the season-cracking may be demonstrated as follows: If the sheet brass is merely *forced* into shape, in the same manner that a paper article would be made, the metal is drawn unevenly and strains then exist in the article. It is these strains, always present, that finally produce the season-cracking. If, however, the punch and die are made so that the metal is stretched evenly all over, the strains in the formed article will be even and the brass will not season-crack. In other words, it is the presence of uneven strains in the sheet brass article that produces the season-cracking, and so many instances have been found in which this has proved to be true, that it seems to leave no doubt about its being the cause of the majority of cases of season-cracking.

## The Growth of Steel Ball Burnishing.

It is believed that the use of steel balls for burnishing is a Yankee invention. How far back they were first used, is uncertain, but in the year 1906 there was described in the October issue of THE BRASS WORLD, the method used for burnishing with steel balls. As far as known this was the first time anything had been published on the subject. The process had been in use before that time, in the jewelry industry in Attleboro and Providence, and in one or two Connecticut concerns making small metal goods, but the fact that polishing could readily be acomplished by hard steel balls was not generally known.

In those days, the regular steel balls used for ball bearings were used as there was nothing else to be had, and while satisfactory, these balls were quite expensive, so much so, in fact, that many possible users were frightened by the amount of money that was necessarily expended for the balls. Others attempted to economize on the balls and used too few with the result, as always happens, that the work was unsatisfactory. The cause of the high price of the balls used for ball bearings is the fact that they must be of very accurate diameter which greatly increases the cost of manufacture. Then attempts were made to use the "seconds" produced in making the balls. These could not be obtained in quantity, however, and were not always satisfactory, either in price or quality.

It was not until the manufacture of the balls specially for use in burnishing by tumbling was commenced that any marked advance was made in the art. It was found that the requirements of balls for burnishing are that they shall be hard, of even temper and polished. It matters not whether they are quite spherical and it will be found that they are more or less out of round. This very fact, however, is the reason why the balls can be made as cheaply as they are.

The use of steel balls for burnishing in the tumbling barrel has, within the past few years, expanded at quite a rapid rate and it is now surprising what a large variety of work is polished by this method. At first confined to jewerly, it was taken up by manufacturers of small metal goods in Connecticut, until at the present time manufacturers are now using the process all over the world; and it is employed on nearly two hundred different kinds of goods, from some of the smallest articles made, such as eyelets, to such work as tack pullers and skates. Plated and unplated goods are alike treated.

The growth of the art may readily be appreciated by the fact that the business has been practically built up by one manufacturer of steel balls, and who has, from the very start, made nothing but balls for use in burnishing

# The New Rolling Mill of the Stamford German-Silver Company at Springdale, Conn., Manufacturers of German-Silver and Nickel Anodes.

German-silver has always been considered an insignificant part of the brass rolling mill business and is frequently called one of the "specialties." It has always been an unsatisfactory portion of the business, too, unless it has been well understood by the brass manufacturer, as it is subject to so many eccentricities of manufacture that men particularly trained for the work must be employed or the quality of the metal will suffer. It has been said that anyone who can make brass can make German-silver, but to make it so that it will fill the requirements of the trade is a very different matter and those who can produce this capricious alloy can consider themselves at the head of their trade. The ordinary brass caster cannot do it and those who have been especially trained for the work are required and it is these who have been successful.

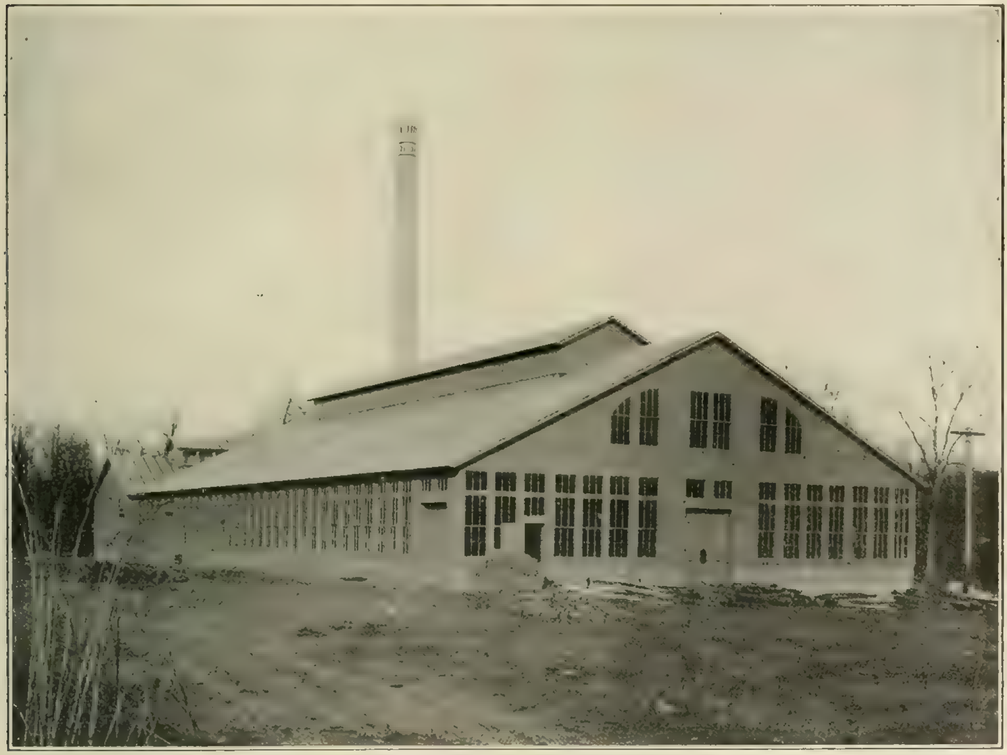


Fig. 1. View of the New Rolling Mill of the Stamford German-Silver Co., Springdale (Stamford), Conn.

It is for this reason that the majority of brass rolling mills have never undertaken the manufacture of German-silver to any extent. Many of them do not make it at all and those who have undertaken it either have made a specialty of its manufacture so that they can meet the requirements of all classes of the trade, or have made it only on a small scale for uses where the requirements are not at all severe. Rolling mills which have specialized on German-silver have been few in number. The others have usually found it expedient, from a business standpoint, to let it alone as they could not make it show any profit. While, at the present time, there are a good sized number of rolling mills in the United States, there are but few that can be said to make German-silver which will answer the specifications of the trade, particularly that most exacting class—the flat-ware makers.

The largest use of German-silver is in the manufacture of flat-ware and it was also the first, as far as the United States is concerned. German-silver, however, has long been known and was in use in China several centuries ago under the name of "packfong" or "packtong" which means "white-copper." This has been found, from analysis of early specimens to contain about 40% of copper, 45% of zinc and 15% of nickel. It is probable that this mixture was prepared in a manner similar to that of "calamine-brass," the predecessor of the present variety of common brass, or by reducing zinc ore in presence of copper thus producing the alloy direct. As far back as 1770, German-silver was made in Europe, and in 1824 it was made by Dr. Geitner of Schneeberg, Germany, under the name of *argentan*. These same works are still in existence in Germany and are now known as "Dr. Geitner's Argentan Fabrik" and German-silver is the principal product.

Soon after this the manufacture of German-silver commenced in England, and later in the United States. At just what period the manufacture of German-silver was commenced in this country is uncertain, but it is believed between 1850 and 1860, or about the time that the manufacture of flat-ware was commenced here.

The manufacture of flat-ware was soon followed by hollow-ware, although on a much less scale. Of late years, however, this has greatly increased so that many classes of hollow-ware, that previously were made only in britannia-metal, are now manufactured of German-silver.

While the manufacture of flat-ware and hollow-ware, in which German-silver is the base metal, has grown enormously within the past twenty-five years, many new uses have been discovered for it. Its employment in the flat-ware industry is caused by the fact that it is the only white metal of sufficient non-corrosive properties and hardness that can be used. For years, this was practically the only outlet for any quantity of German-silver. Within the past few years, however, there has been created another new field of an entirely different nature and this is in the electrical trades. German-silver wire has a high electrical resistance, and in addition it possesses excellent non-corrosive properties which, together with its strength, particularly adapts it for use as a resistance material in the manufacture of electrical apparatus and appliances. While some sheet and strip are used for this purpose, the greatest consumption is in the form of wire. One of the valuable features of German-silver for resistance work lies in the fact that, by altering the percentages of the ingredients in the mixture, the resistance can be made greater or less, as may be desired.

In addition to the "straight" German-silvers, which consist of copper, nickel and zinc only, another class of alloys now finds extensive use. They are known as the "cupro-nickels" and [illegible] of 3 parts of copper and 1 part of nickel. Bullet jackets, used as the covering for the lead bullets of cartridges are also made of cupro-nickel but with a less percentage of nickel The alloy is also used in the form of wire.

That the demand for German-silver products has greatly increased of late, is evidenced by the fact of the starting of the Stamford German Silver Company at Stamford, Conn. This new company was organized in the fall of 1912 by men long connected with the German-silver industry and who, realizing that the field has become enlarged to such an extent as to warrant a new enterprise, decided to erect a new rolling mill for the manufacture of German-silver sheet, rod and wire and their allied products.

A tract of land was obtained in Springdale, Conn., a suburb of Stamford, in close proximity to the N. Y. N. H. & H. R. R., and directly opposite the Springdale station. A large tract of land has been obtained so as to give the company ample room, both for present needs and future expansion.

The rolling mill has not been completed, at the present writing, although the building itself has been finished and the equipment purchased and much of it installed. It is expected that the rolls will be installed by May 1st and the mill will then be in full operation.

The buildings are two in number as may be seen in Fig. 1. The main building is the rolling mill proper, and in the rear, as a separate building, is the casting shop. This casting shop has been in operation for some time and the manufacture of cast nickel anodes is being carried on. This is one of the special portions of the business and will be conducted in connection with the making of German-silver, with which it is so closely allied.

The casting shop is shown in Fig. 2 and contains twenty furnaces served by the stack seen in Fig. 1. This stack is of concrete construction, reinforced by steel rods and heavy woven wire cloth The stack is 125 feet high and represents modern construction in chimney building. With this height, ample natural draft is had under all conditions of the atmosphere.

The furnaces are of the usual square shape, employed in practically all rolling mills, and 16 inches square, taking a No. 60 crucible. Natural draft exclusively is employed. In front of the furnace over the pit, oak planking is used. It has been found in casting shop experience, that a wood floor is the most satisfactory. It is almost exclusively used. Its advantage lies in the fact that it gives a good footing, upon which men are not apt to slip and does not become hot like metal. The danger from fire is practically nothing on account of the thickness of the wood. Should coal drop from the crucible on it, it is soon seen and removed. As the floor is made of narrow strips and slotted, it is an easy matter to repair it. This floor, of course, only extends over the pit in front of the furnace, and the remainder of the casting shop is covered with iron floor plates.

As previously stated, the manufacture of nickel anodes is already being carried on at the works. These are cast in green sand in ordinary foundry molding flasks, some of which may be seen in the foreground of Fig 2. The sand used is No. 1 Albany and the anodes are cast with the flask slightly inclined The sand is not dried at all, but the anode is left in the mold until it has completely cooled In this manner a bright, clean anode is obtained and one that does not need sand-blasting to clean it. The anodes, after casting, receive no treatment whatever, except to drill the holes.

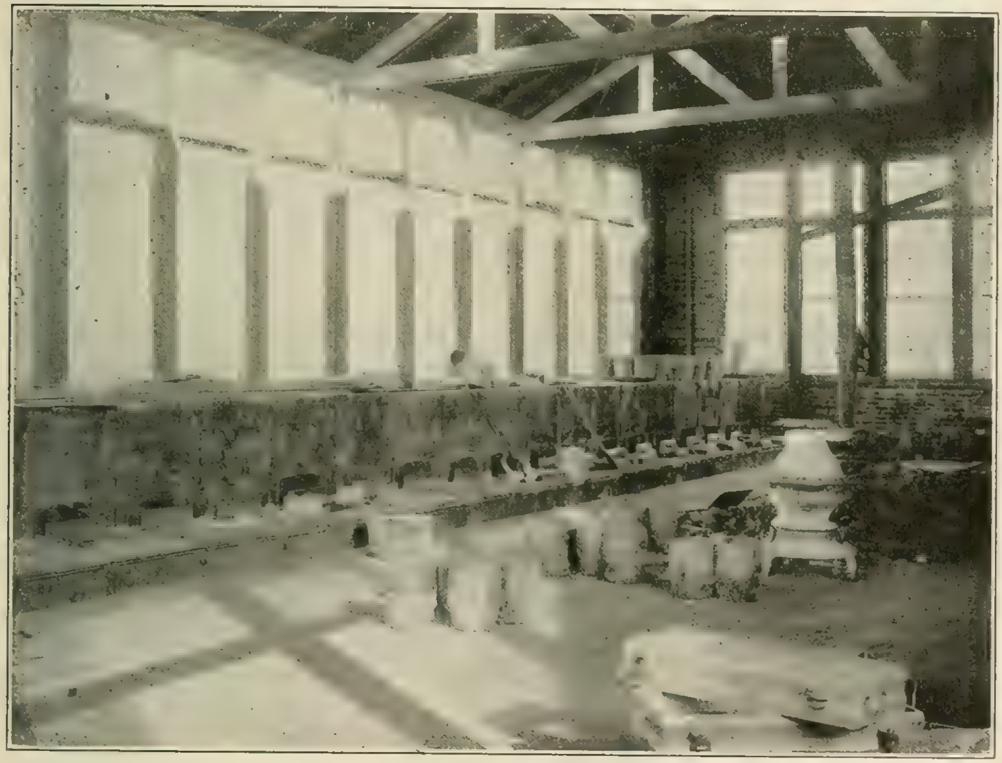


Fig. 2. Interior View of Casting Shop, Showing Pit Furnaces and Flasks for Casting Nickel Anodes.

The fuel used for melting, is hard anthracite coal, and the coal pile is shown in Fig. 3 A small amount of coke is occasionally used with the coal, when a quick, hot heat is desired, but the coal is employed in nearly all instances on regular work.

As previously mentioned, the rolling mill is not quite ready for business. The power will be supplied by a 300 H. P. electric motor, the electric current being obtained from the

Stamford Gas & Electric Co. Two stands of 18 inch rolls will be used at first, with provision for additional stands when the occasion demands it.

The annealing will be done in a double end muffle supplied by the W. S. Rockwell Co. of New York City, and in which oil will be used for the fuel. The oil tank to be used to supply the fuel and store it is shown in Fig. 3. This tank holds 10,000 gallons of fuel-oil which will supply sufficient storage capacity for all ordinary contingencies. The oil will be unloaded from tank cars by a pipe line as the distance to the railroad siding is short. The muffle is underfired and is so constructed that in case of a necessity, coal may be used for the fuel. The use of wood for annealing, at once so prevalent in the brass rolling mill business, has almost passed out of existence on account of its high price.

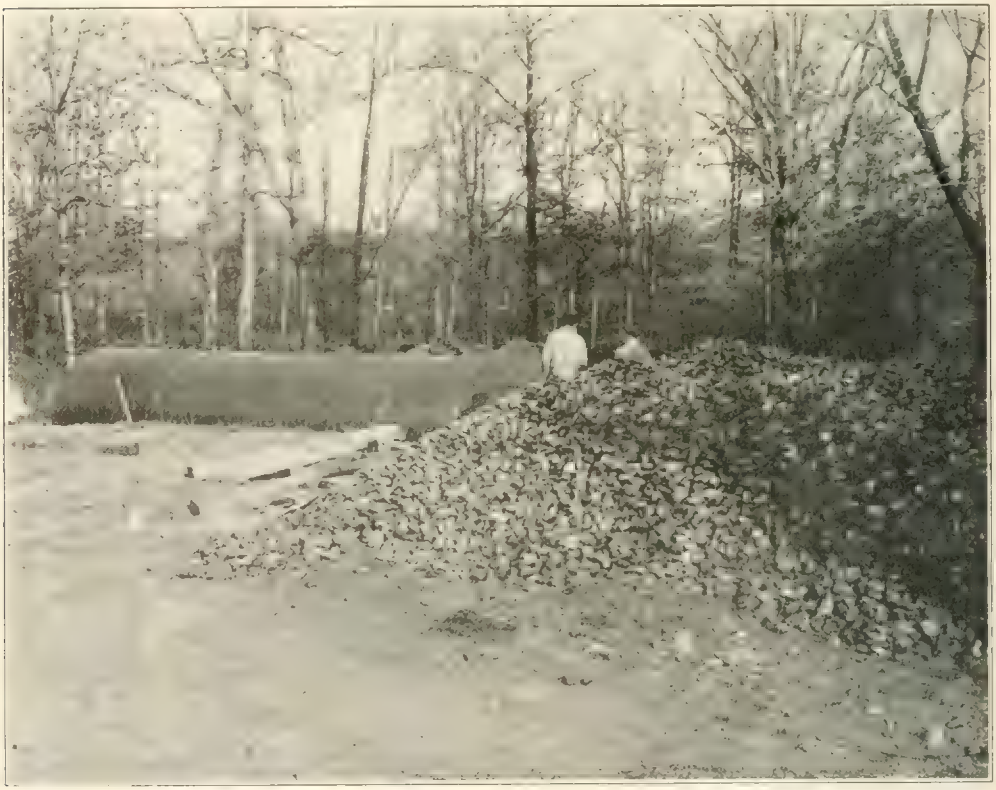


**Fig. 3. Showing 10,000 Gallon Oil Tank for Holding Oil for Annealing, and the Pile of Anthracite Coal for Melting.**

It is expected that when the mill is completed, it will be one of the most complete and modern in the United States and will be uniqu in that it will manufacture only German-silve and other nickel products. This will include German-silver for flat-ware and hollow-ware resistance wire, and other products in the form of sheet, wire or rod; cupro-nickel in sheet, rod and wire and all other special nickel alloys, of which there are now many. One of the new uses for German-silver, and which shows the promise of being a large one, is in the manufacture of automobiles. All trimmings are now white and it has been customary to use brass and nickel plated it, but in the best grade of cars it has become the practice to use German-silver instead of brass, either as the bare metal or to nickel plate over it. Polishing, therefore, will never reveal anything but white metal. Each year will undoubtedly show an increased consumption of German-silver in the automobile trade as it has been found so serviceable that manufacturers are obliged to utilize it

## Use of Antimony in Place of Tin in Composition Mixtures.

The high price of tin has been instrumental in causing brass founders to investigate the substitution of antimony for tin in composition or bronze castings. Antimony is so much cheaper than tin that it would appear quite attractive

Let it be said that antimony may actually be used as a *partial* substitution for tin in composition or bronze mixtures, but cannot be employed to replace it entirely. Antimony alone does not harden copper to the same degree as tin, but when used as a partial replacement quite satisfactory results can be obtained.

The following mixture containing antimony is one employed by a firm of brass founders in the east for the making of a miscellaneous assortment of composition castings. These castings are of the assortment found in the average jobbing brass foundry and which are made of red metal. For heavy castings it is not used as other mixtures are more suitable; but for general lines of jobbing composition work it can be employed with equally as good results as the mixture without tin. The color is red, like that of good composition and the metal casts well. In machining it works satisfactorily. The mixture is as follows:—

| | | |
|---|---|---|
| Copper ............ | 8 lbs. | or 83.12% |
| Zinc .... | 1 lb. | or 10.40% |
| Tin ...... | 4 oz. | or 2.59% |
| Lead .... | 4 oz. | or 2.59% |
| Antimony . | 2 oz. | or 1.30% |

The copper is melted first under a good covering of charcoal and then the zinc is added. The antimony is next introduced and finally the tin and the lead.

No special precautions are necessary in pouring the mixture as it casts like ordinary composition. The pouring temperature is about the same also and molders will usually notice no difference at all in the manner in which the mixture casts.

The addition of more antimony than the amount given in the formula will cause brittleness and it has been found by experience that the amount stated is the maximum which can safely be employed.

That antimony has long been used in making brass foundry mixtures may be appreciated from the following formula This has been in use for many years in the manufacture of bronze (or composition) hardware, and has given satisfaction:

| | |
|---|---|
| Copper ...................... | 84 lbs. |
| Zinc ..... | 8 lbs |
| Tin ...... . | 4 lbs |
| Type-Metal .................. | 4 lbs. |

Type-metal consists of the following:

| | |
|---|---|
| Lead ........................ | 58% |
| Antimony .................... | 26% |
| Tin ....... | 15% |
| Copper .... | 1% |

The amount of antimony introduced by this mixture, it will readily be understood, is about 1% which is smaller than the quantity given in the first mixture, but it seems to have an effect on the bronze in that it replaces an equal amount of tin and gives a good metal for the average run of red brass work.

## Crystallization of Bronze Turbine Blades.

When steam turbines were first brought into use, bronze and brass blades were used, but these were found to be subject to the phenomenon of crystallization and steel has since replaced them. In an article on the Recent Developments of Steam Turbines in the *Journal of the Franklin Institute,* H. T. Herr made the following remarks upon the substitution of steel blades for those of bronze:

"It is a fair statement to make that scarcely any turbine of anybody's make ever gave trouble due to the blades breaking or coming out because of centrifugal force. It is not centrifugal force that breaks the blades, but vibration of the blades themselves, and until lashing of the longer blades was resorted to, breaking was occasioned by the individual vibration. The lashing or shrouding of the blades therefore reduced very materially this difficulty. Twelve years ago The Westinghouse Machine Company experienced some unaccountable breaking of blades which were made of bronze. This was attributed to fatigue of the metal of the blade, or repeated heating and cooling, and led, as a cure to the difficulty, to the adoption of steel as blade material. Later experience and analysis of these troubles reversed the impression first obtained and led to the conclusion that the difficulty was really due to blade vibration."

## Use of Osmium as a Hardener for Platinum.

Pure platinum is quite soft and unsuited for many uses in which a harder metal is necessary. It has about the hardness of soft, wrought iron, and in order to become adapted to the majority of commercial uses it must be hardened. Iridium is the metal most generally used, but owing to its expense, it is instrumental in increasing the cost of platinum containing it. In this connection it may be said that practically all commercial platinum is hardened and in commerce it is known as "hard platinum."

The use of osmium as a hardener for platinum has recently been patented by Fritz Zimmerman of Baker Co., Newark, N. J., the well known manufacturers of platinum wares. In connection with the use of osmium to replace iridium as a hardener for platinum, he says:

Heretofore platinum has been alloyed with iridium in various percentages. The higher the percentage of iridium which is added to the platinum, the greater is the resulting hardness. The highest percentage of iridium alloyed with platinum is about 30%. The alloy of platinum and iridium is known in the trade as 'iridio platinum,' or in short 'hard platinum.'

The steadily increasing demand for hard platinum, the limited supply of iridium and its high price, have created a demand for a cheaper hard alloy of platinum with a precious metal which can be supplied at less cost than the iridio platinum.

I have found by a series of practical tests that the addition of osmium to platinum greatly increases the hardness of the platinum. The percentage of osmium which has been alloyed by me with platinum varies from less than ½ [illegible] alloys of platinum and osmium containing more than 10% of osmium are only workable with difficulty, while alloys containing a percentage of osmium higher than 30% are brittle and hardly workable. It was further found that by alloying platinum with osmium so far as hardness is concerned, one part of osmium is the equivalent of 2½ parts of iridium, and that the tensile strength of the alloy is very high, so that a fine wire of platinum-osmium is more easily produced than a fine wire of iridium-platinum of the same hardness. It was further found that an alloy of platinum and osmium containing [illegible] can be advantageously used, for jewelry work, it being hard and tough, while alloys containing [illegible] osmium will replace iridium platinum containing [illegible] iridium for contact points in electrical apparatus. As there is very little demand for osmium, the same can be obtained at a much lower cost than the more expensive iridium, while it is in every other respect when alloyed with platinum, as regards hardness and tensile strength, the equal of iridium-platinum. The osmium-platinum alloy is also more resistant to the action of acids than platinum.

For melting platinum and osmium together, it is necessary to refine the platinum and osmium of commerce to a high degree of purity so as to remove from the platinum the small quantities of metals of the platinum group and other impurities, and the impurities contained in the osmium. It is well known that platinum, as found in nature, contains osmium as well as other metals of the platinum group; also copper and iron, but it is impossible to make use of this natural product as an alloy, as the presence of the other metals impairs the [illegible] of the osmium-platinum alloy.

The new alloy herein described, which is obtained by melting together refined platinum and refined osmium, combines great tensile strength with hardness and ductility, and is thereby adapted in a high degree for application in the arts.

## Correspondence.

### Plugging Blowholes in Brass Castings.

*Editor:*

Referring to the inquiry [illegible] THE Brass World in which it is asked for a method of stopping blowholes in castings so that they may be plated, suggest that you advise them to drill a hole in the casting sufficiently large and deep enough to cut it away, and then drive in a copper plug. This plug must be driven in tight. Then file off, polish and electroplate.

Thousands of castings are saved every day by following this method.

*Canton, Ohio.* *BUCKEYE MFG. CO*

## Copper Plating Die Castings.

Die castings are a new class of metal products that have appeared on the market in the past few years, and the number of makers now producing them seems to be increasing. They are used because they require no machine work and are cast accurately to size and shape. It has been found impossible to make them of brass or other copper alloy and they are invariably composed of white metals with a low melting point. The greater part of the die castings found on the market are composed of a zinc base. Now and then tin base alloys are found, but they are not as hard as the zinc base mixtures and are more costly. For some cheap work, die castings of lead and antimony are used.

The die castings which the plater is called upon to plate, are almost entirely those composed principally of zinc. Each maker may have mixtures which vary a little and, in fact, he may vary them himself to suit the case, but the average mixture employed for this work is as follows:

| | |
|---|---|
| Zinc ..... | 85% |
| Tin .......................... | 10% |
| Copper ........................ | 3% |
| Aluminum . . . . | 2% |

It will be found that aluminum is used in nearly all the die castings. Its amount, however, is small and it does not have the effect on the plating that a large quantity would have. The preceding mixture is varied to suit different cases, as far as the proportions are concerned, but within very narrow limits. The die castings, however, will all contain zinc, tin, copper and aluminum, and the proportions will not vary more than a few per cent. in the ones turned out by different makers.

The electroplating of die castings is one of practically plating zinc. Zinc is plated daily without difficulty both in the form of sheet and castings. High grade fancy lamps, jewel-boxes, art metal goods and similar wares are made of zinc and are plated with all kinds of finishes. Die castings are plated in the same manner.

If die castings are plated in the ordinary cyanide copper solution, an apparently good coating of copper will be obtained, but it will begin to blister as soon as it is removed from the solution and they will increase until it seems as if the deposit were all blisters and nothing else. The ordinary solution, therefore, cannot be used. In Fig. 2 is shown a die casting plated in the ordinary copper solution and in the ordinary way and which blistered very badly. Many platers have, undoubtedly, encountered this same trouble as it is the one which has been found in the plating trade in general.

To copper plate die castings a cyanide copper solution is used, but it must have the following characteristics:

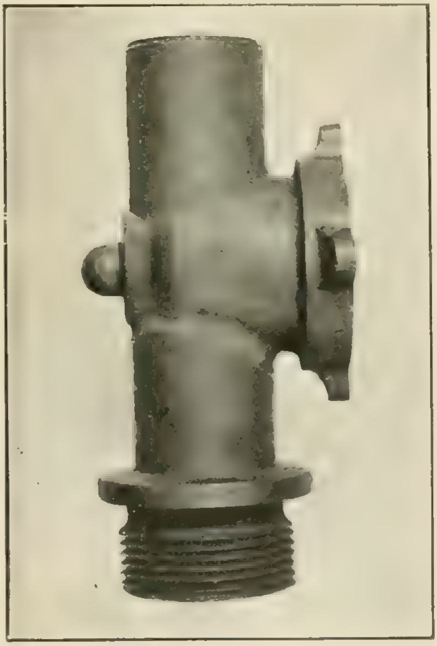


Fig. 1. Sample of a Die Casting.

1. It must be used hot, say at a temperature of about 150° F.
2. It must be weak in metal.
3. The amount of free cyanide must be very small.
4. The current density should be quite low.
5. The die casting must be perfectly clean.

To make the solution, proceed as follows: Dissolve 2 oz. of potassium cyanide (or sodium cyanide) in 1 pint of water. Then dissolve in it all the carbonate of copper it will take up or in other words, saturate it with the carbonate of copper. Do not have any carbonate of copper undissolved, or, at least only a very small quantity. It is preferable, in order to make sure that all the cyanide is saturated with the carbonate of copper, to have just a little of the green carbonate floating around in the solution when stirred. It must be very little, however, or the right conditions will not be obtained.

Now add 1 oz. more of potassium cyanide (or sodium cyanide) for free cyanide. Then add water to make up to 1 gallon. The solution will now stand at about 3° Beaumé.

For use, heat to about 150° F. Use copper anodes and cut the current down so that it is between 1 and 2 volts and the gas is just barely given off from the work. The copper will deposit rather slowly, but the casting to be plated will be covered in a minute or two. The object is to get the copper on with as weak a current as possible and with as little gas given off so that blisters will not form. The use of a weak solution, little free cyanide and weak current will produce this condition.

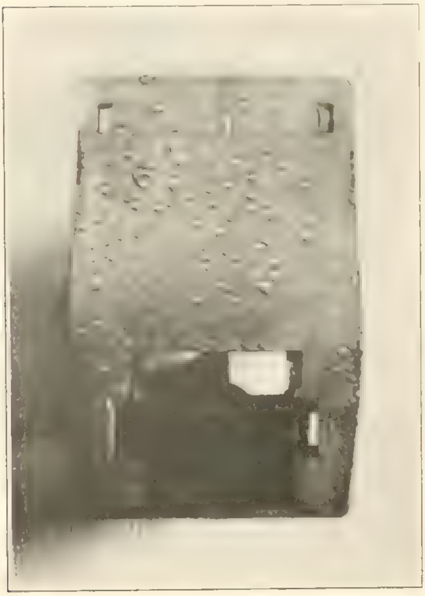


Fig. 2. A Blistered Copper Plated Die Casting.

The cleaning of the castings is important, for they will be found tarnished and often covered with a white film of oxide of zinc if they have been kept in a damp place. The only way in which they can be cleaned is by scrubbing with a brush and pumice. The pumice is finely powdered and used wet. Die castings that have been badly corroded may be dipped in a pickle of 4 parts of water and 1 part of muriatic acid. This will remove the white film from the surface, but scrubbing must be used to clean them afterwards.

Do not leave the die castings in the potash kettle or they will be attacked. Zinc is dissolved by potash or soda. The castings will need but a slight dip in the potash kettle (the potash or soda should be weak) after scrubbing, and rarely not at all if care is used in handling. The scrubbing removes the grease and dirt from the surface.

The castings should be bright and free from stain. Deposit the copper in the solution previously given and if done well, no blisters will be found. The copper from this hot solution is bright and deposited in an excellent condition.

The success of die castings lies in the use of the hot cyanide copper solution, containing very little free cyanide, low in metal and with a weak current. The evolution of the gas from the surface is an indication of how the plating is proceeding and should come off very slowly. If a rapid evolution of gas is found, such as produced by too much free cyanide or the use of too strong a current, the blisters will usually go with it.

In the use of a hot and weak cyanide copper solution of this strength, very little free cyanide is required to keep the anodes clean. If it is found that they cover over rapidly, then too little is present and more can be added, but care should be used in not introducing an excess. If they coat over only after a time, then it is well to let the amount of free cyanide alone and take the anodes out and clean them off. Such a condition usually indicates that the conditions are about right.

Platinum, as a material for producing the French-gray finish on silver, has almost passed out of existence. Owing to the high price of the metal, black nickel has now almost supplanted it.

Manganese-bronze is very sensitive to the tin that is usually added to the mixture to increase the elastic limic. Brass founders who make it themselves and find that it is brittle with a coarse fracture, will usually find that they have exceeded the amount required either by weighing the tin on heavy scales not adapted for small amounts, or from not knowing the exact quantity to use.

## Fluxes for Use in Melting Soft Metals.

When the so-called soft metals, such as tin, lead, zinc and their various alloys, are melted, the surface of the molten metal oxidizes and produces what is known as "dross." Dross is the metallic oxide mixed with more or less metal. It is not all oxide as many persons believe, but the oxide becomes entangled in the metal itself, producing a mass which becomes thick and does not flow readily.

It is the function of fluxes, when soft metals are melted to act upon this dross (or in reality, the oxide in it) and clean and clear the surface of the metal.

Those who are not familiar with the action of fluxes should try an experiment and be convinced of their value. Melt some lead and it will be noticed that the surface is covered with a film. If the lead is scrap material, then a greater quantity of dross will form for the reason that the scrap lead is already oxidized to some extent and this oxide floats on the surface of the metal. Now throw on a small piece of rosin. The rosin will immediately melt and clear the surface so that it will have a bright appearance and as clean as the surface of pure water. The rosin dissolves the oxide, forming a slag which floats to the side of the ladle in which the lead has been melted, and may readily be skimmed off.

The use of fluxes in melting soft metals is quite important, particularly when scrap metals are used, as they serve to cleanse the molten metal from oxide and produce clean, clear material that will readily run into molds. Scrap metals, as a usual rule melt with the formation of considerable dross, and if no flux is used on them, the bars of metal cast will not be clean. By the use of fluxes, however, it is possible to obtain nearly as clean metal as though new materials had been employed.

The question as to what kind of flux to use in melting soft metals will depend upon the metal itself. The following directions may be safely followed:

*Tin and its Alloys*—This list comprises the solders, britannia-metal, block tin, babbitt-metals with a tin base and any other alloys of which tin is the principal constituent.

For tin and its alloys, *rosin* is the best flux as it requires but a small quantity on the surface after melting to clean it. *Sal-ammoniac*, too, is a good flux for tin and seems to work better if the metal is used quite hot; and at a temperature at which the rosin burns off. The rosin, however, is to be preferred as it is free from the fumes of sal-ammoniac.

*Lead and its Alloys*—This class comprises some of the solders, which contain lead in ex cess, babbitt-metals with a lead base, pewters, and the various antimonial-lead alloys, together with pure lead itself, and other various alloys containing lead as the principal ingredient. For lead and its alloys, *rosin* is the best flux. It acts in a manner similar to that of tin and at once clears the surface. Sal-ammoniac does not work well on lead or its alloys unless quite hot and then it seems to have a good effect. This action, however, is not satisfactory when the lead is at the heat ordinarily used for pouring metals, and the temperature at which it does act is so high that it is rarely employed in practice. The rosin, therefore, is the best flux for use in melting lead and its alloys.

*Zinc and its Alloys*—There are but few zinc alloys used, of which zinc is the principal constituent, and one of the chief components of this class is the well known die castings. The white brasses( some of the white brasses contain tin as the principal ingredient) are also made with zinc as the chief constituent. Zinc itself, however, is extensively used. The best and in fact the only flux that can be used on zinc and its alloys is *sal-ammoniac*. This has an excellent cleansing action and produces clear, clean metal from that which is quite dirty. Rosin is not suitable for use on zinc and its alloys, and although it has some cleansing action, it is not satisfactory. Sal-ammoniac, however, seems to give all that is desired in the way of a flux for zinc and its alloys.

The manner of using the fluxes is simple. After the metal is melted, whatever it may be, tin, lead or zinc, or their alloys, the flux is thrown on the surface and stirred in. No particular amount of flux can be given for use, as it will depend upon the amount of dross to be cleaned from the surface. The way to do is to throw on a small quantity of the flux, stir and skim off the dross as clean as possible. Then add more, if required, until the surface is clean. By adding the flux little by little, instead of a large quantity at one time, the progress can be watched, and it is not wasted for the reason that only just enough is used to clean the metal.

The fluxes are always used on the surface after the metal is melted, and are *not* put in while the melting is taking place.

## Progress of Work on Specifications for Babbitt-Metals.

The Sub-Committee of the American S[illegible] Materials and known B-1, are evolving standard specifications for [illegible] small number which will, it is believed, be sufficient to meet all needs. There are [illegible] a very large number of babbitt-metal mixtures in use, the majority of which differ only by a very small pro[illegible] [illegible] this number, will undoubtedly, be [illegible] the Ajax Metal Co., is chairman of this committee.

[illegible] resenting G. W. Th[illegible] [illegible] ring the work previously laid out.

[illegible] were furnished by five members of the committee and the [illegible] the tabulation of the results and the theoretical formula:

[illegible] ably except the analysis reported by T. D. [illegible] with the exception of those reported by T. D. Lynch and W. M. Corse. The results with [illegible]

Mr. Clamer, Mr. Cowan and Mr. Smith reported that they had followed strictly the Committee's recommendation that samples be taken by sawing at right angles to the bar, completely through the bar at these places, namely, one each from the ends and through the middle. Mr. Lynch reported that his samples had been taken by drilling, and Mr. Corse stated that he was not certain whether samples had been taken by drilling or sawing, but has since reported that his samples were taken by drilling. It was agreed that the members should exchange their complete methods of analysis.

The principal points which can probably be [illegible]

*First*: Determination [illegible] the [illegible] the list in place of No. 1 and [illegible] sition as it should be still further hardened [illegible] addition of copper and antimony. The present sample No. 4 is probably satisfactory [illegible] r with slight modification render[illegible] [illegible] bably be made a little harder.

[illegible] data at present at hand by the Committee, this series should be re-arranged approximately as follows:

| | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | |
| [illegible] | [illegible] | [illegible] | [illegible] | |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | | [illegible] |
| [illegible] | | [illegible] | | [illegible] |

It is believed that these five standard formulas of babbitt-metal satisfactorily cover the range for all requirements, thus eliminating the thousands of slight variations which are at present made in these five standard types, for [illegible] particular reason or advantage.

*Sampling*

As the correct sampling of babbitt-metal is [illegible] vital importance, and as it would appear that the method of taking drillings, from ex[illegible] Committee, is a poor one; and the fact that this seems to be confirmed by analyses of samples Nos. 3, 4 and 5, made in the laboratories of the Lumen Bearing Company and the Westinghouse Company, it will be of considerable interest to obtain the check analyses from these two laboratories on samples taken in strict accordance with the recommendations of the Committee. Mr. Corse and Mr. Lynch agreed to have their analyses duplicated on samples taken by this method of sampling. Mr. Cowan suggested that samples be sent to the Bureau of Standards at Washington to check the results obtained by the various members of the Committee, and it was accordingly agreed that each member send a portion of each sample of the alloys analyzed by him; or in cases where the original samples were not retained, that they take new samples by sawing through the bars in close proximity to the original cut. In instances where the sample had been used for other tests, to re-sample by sawing in order to obtain as satisfactory a sample as possible.

*Compression Tests*

A discussion was held relative to the value of Brinnell tests, as compared with compression tests for indicating the hardness and flow of babbitt-metals. Compression tests were made by Mr. Lynch and Mr. Corse. Brinnell tests were made by Mr. Thompson and Mr. Lynch. Mr. Lynch also made hammer tests of the various samples, but as the result obtained were rather conflicting, due to difference in method of making the tests, it was decided that it would be well to repeat this part of the work Mr Lynch promised to

*Experiment No. 1.*

| | Tin | Antimony | Copper | Lead | Other Metals |
|---|---|---|---|---|---|
| Theoretical | 89.00% | 7.00% | 4.00% | | |
| G. H. Clamer | 88.70% | 7.20% | 3.40% | 0.58% | |
| T. D. Lynch | 89.00% | 7.40% | 3.40% | 0.20% | |
| H. E. Smith | 88.53% | 7.11% | 3.93% | 0.19% | Arsenic..0.05% |
| G. W. Thompson | 88.57% | 7.09% | 3.92% | 0.38% | Arsenic..0.09% |
| W. M. Corse | 88.52% | 7.00% | 3.70% | 0.21% | Zinc.....0.26% |

*Experiment No. 2*

| | Tin | Antimony | Copper | Lead | Other Metals |
|---|---|---|---|---|---|
| Theoretical | 83.33% | 8.33% | 8.33% | | |
| G. H. Clamer | 83.40% | 8.30% | 7.50% | 0.05% | |
| T. D. Lynch | 82.40% | 9.00% | 8.40% | 0.20% | |
| H. E. Smith | 82.65% | 8.51% | 8.34% | 0.28% | Arsenic..0.06% |
| G. W. Thompson | 82.56% | 8.54% | 8.44% | 0.35% | Arsenic..0.09% |
| W. M. Corse | 83.00% | 8.34% | 8.35% | 0.27% | Iron...0.13% |

*Experiment No. 3*

| | Tin | Antimony | Copper | Lead | Other Metals |
|---|---|---|---|---|---|
| Theoretical | 50.00% | 12.00% | 1.00% | 37.00% | |
| G. H. Clamer | 50.00% | 12.00% | 0.60% | 37.28% | |
| T. D. Lynch | 53.50% | 11.00% | 0.10% | 34.00% | |
| H. E. Smith | 50.07% | 11.72% | 0.80% | 36.96% | Arsenic..0.02% |
| G. W. Thompson | 49.75% | 11.36% | 0.81% | 37.96% | Arsenic..0.09% |
| W. M. Corse | 49.80 | 11.68% | 0.84% | 37.54% | |

*Experiment No. 4*

| | Tin | Antimony | Copper | Lead | Other Metals |
|---|---|---|---|---|---|
| Theoretical | 7.00% | 17.00% | | 76.00% | |
| G. H. Clamer | 7.20% | 17.10% | 0.08% | 75.51% | |
| T. D. Lynch | 10.02% | 18.10% | | 71.60% | |
| H. E. Smith | 7.14% | 17.06% | 0.02% | 75.55% | Arsenic—0.01% |
| G. W. Thompson | 7.20% | 16.85% | 0.04% | 76.06% | trace |
| W. M. Corse | 5.01% | 15.44% | | 78.50% | |

*Experiment No. 5*

| | Tin | Antimony | Copper | Lead | Other Metals |
|---|---|---|---|---|---|
| Theoretical | | 10.00% | | 90.00% | |
| G. H. Clamer | 0.05% | 10.00% | 0.16% | 89.66% | |
| T. D. Lynch | 2.30% | 11.40% | | 86.20% | |
| H. E. Smith | | 9.91% | 0.01% | 89.90% | Arsenic..0.02% |
| G. W. Thompson | | 9.04% | trace | 90.04% | trace |
| W. M. Corse | | 9.55% | | 90.40% | |

[illegible]

## The Corrosion of Aluminum.

In a paper on "The Corrosion of Aluminum" read at the March meeting of the British Institute of Metals, G. H. Bailey gave the results of his experiments and observations on the corrosion of aluminum.

[illegible] aluminum [illegible] manufacturing [illegible]

[illegible]

1. [illegible] purity, aluminum [illegible]

2. [illegible]

3. [illegible] more pro[illegible]

4. [illegible]

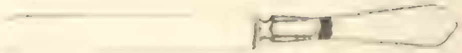
5. [illegible] purities in the water, especially alkalies.

6. [illegible] doubt to the unequal pl[illegible] the metal in the unannealed state.

7. [illegible] water or aqueous solutions. Had it been possible [illegible] of the corrosion of aluminum would have been much simplified, since the difficulties presented by the formation of suspended or adherent deposits would be eliminated.

## A New Method of Fastening Hollow Handles to Steel Blades.

[illegible]



[illegible]

[illegible] The handle 5 is made [illegible] In [illegible] it into [illegible] This provides a small pocket at [illegible] with the shoulder 3 abutting against the [illegible] of the handle. If the usual cement is employed the cement permeates the paper or as[illegible] in the handle. If solder is used, no part [illegible]

[illegible] is preferred to use a small wad or packing [illegible] If solder is to be used, it is desirable to form [illegible]

## Use of Asphalt Paint as a Stopping-Off Varnish in Silver Plating.

Stopping-off in ordinary electroplating, such as nickel or copper does not pay, except in special instances, for the reason that the metals are so cheap that the labor involved in the stopping operation is greater than the cost of the metal saved. It should be understood, of course, that the only object of stopping-off in electroplating is to save metal.

In silver plating the case is different from that of the common metals as the metal is much more expensive and it pays to save it. There are many instances in silver plating where the article is no better for being completely coated with silver, and if a portion of it is stopped off, the results are equally as good and the customer will be fully as well satisfied. This instance is exemplified in the case of automobile lamp reflectors which are now silver plated in order to obtain the white color and allow polishing to be readily carried out. Here the front of the reflector is all that needs to be silvered. The reflector is made of brass and the back never shows and is of no importance. In silver plating, however, the amount plated on the back is equal to that of the front and is entirely wasted, as far as doing any good is concerned. If the back is stopped-off, however, the amount of silver that would be deposited on the back will be saved.

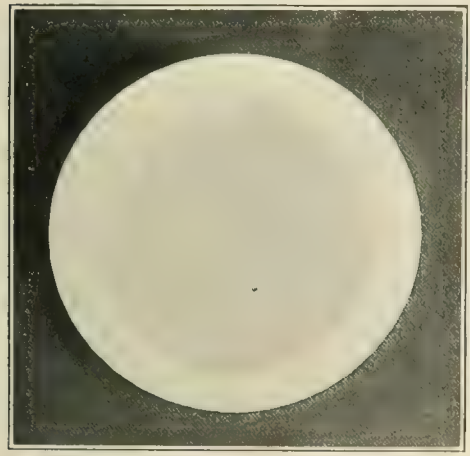


Fig. 1. Front of Silver Plated Reflector.

If it is desired to stop-off a portion of an article to be silver plated, asphalt paint will be found quite satisfactory. It is cheap and is not attacked at all by the silver plating solution; and in fact, it will stand immersion in a potash or other cleaning solution provided it is not left long. The silver plating solution, however, it has no effect on it even after several hours and it may be used for stopping-off without fear.

The asphalt paint to use for stopping-off the portion of the article to be silver plated is the ordinary asphalt paint or varnish of commerce. It is made by nearly every paint or varnish manufacturer and can be purchased at every paint store. It is as cheap as any of this class of material. The advantage of asphalt paint for stopping-off, in addition to its feature of resisting the cyanide solution, is its quick drying properties. It dries hard in an hour or so, if not too thick, and unlike ordinary paints and varrishes does not take days to harden. Outside of shellac varnish, it is the most rapid drying of all commercial paints or varnishes.

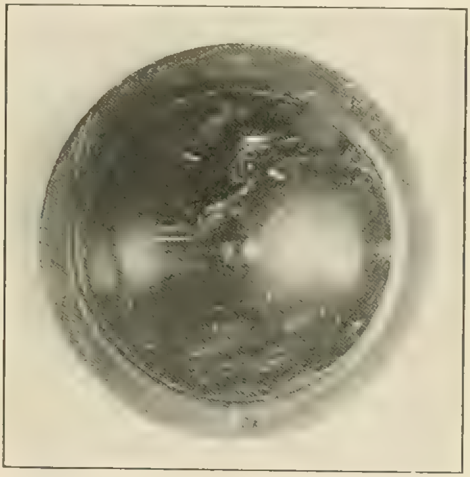


Fig. 2. Back of the Reflector Stopped-Off with Asphalt Paint.

Asphalt paint comes ready for use, but is usually too thick for stopping-off. It is preferable to thin with turpentine or benzine. If benzine is used, it dries more rapidly, but the fire risk is then greater. Turpentine is quite satisfactory. The paint is thinned so that when applied to the article it will be brown instead of black. This method allows more rapid drying, saves paint and is easier to remove after the plating has been done. Even when quite thin and it has a brown color after drying, it has sufficient resisting properties and the cyanide solution will not act upon it. As a matter of fact, asphalt is the most resisting of any material that can be used in

[illegible]

## Pierced Metal Work and Its Advantages.

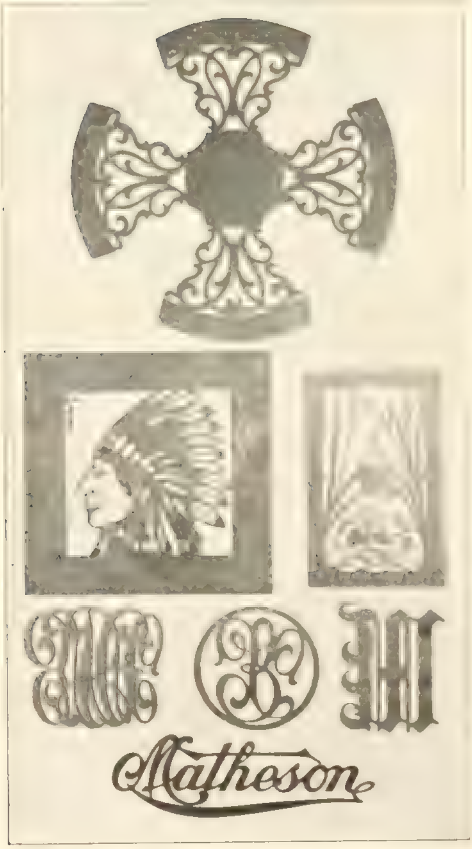
[illegible]

[illegible] that [illegible]

[illegible] meta [illegible]

[illegible] and it matters not what it [illegible] aluminum, zi[illegible]

[illegible] pany, Sudbury Buildin[illegible]



Pierced Brass Work.

## Specifications for Exhaust System for Grinding, Polishing and Buffing Wheels.

[illegible] [illegible]ration of Exhaust [illegible] [illegible]shing and Buffing [illegible] [illegible]ate Department of Labor* and which complies with Section 81 of the Labor Law of that state. The specifications have been compiled by William Newell, A. B., M. E.*, Mechanical [illegible] The specifications are as foll[illegible]

*Explanat[illegible]*

These specifications have been issued with the view of bringing about the efficient removal of dust from grinding and buffing [illegible] prevent the [illegible] struction of exhaust systems on such faulty designs as making the main suction duct much too small and not infrequently the same size throughout its length, running the branch pipes into the main at right angles and sometimes at the bottom of the main, too small a fan, too small a discharge pipe from the fan, too small a cyclone separator or dust collector, etc., with the result that the suction is entirely inadequate to carry off the dust, which then clogs the ducts and spreads about the room to the injury of the workmen's health.

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*Address: care of Department of Labor, [illegible]

A room free from dust is also productive of higher efficiency, both of men and machinery. It has been proven time and again in actual practice that the output of a workman is increased if he works under healthful atmospheric conditions. Freedom from dust is also conducive to less wear and friction, and hence longer life of machinery. Lastly, these specifications will protect manufacturers from spending their money on useless exhaust systems installed by ignorant or careless contractors, which cannot be accepted by this department.

*Specifications*

1. Minimum sizes of branch pipes allowed for different sized emery or other grinding wheels

| Diameter of Wheels | Minimum Grinding Surface Sq. in. | Minimum Diameter Branch Pipe in ins. |
|---|---|---|
| 6 in. or less, not over 1 in. thick | 19 | 3 |
| 7 to 9 in., not over 1½ in. thick | 43 | 3½ |
| 10 to 16 in., not over 2 in. thick | 101 | 4 |
| 17 to 19 in., not over 3 in. thick | 180 | 4½ |
| 20 to 24 in. not over 4 in. thick | 302 | 5 |
| 25 to 30 in. not over 5 in. thick | 472 | 6 |

In case a wheel is thicker than given in the above tabulation, or if a disc, instead of a regular wheel is used, it must have a branch pipe no smaller than is called for by its grinding surface, as given above.

2. Minimum sizes of branch pipes allowed for different sized buffing or rag wheels, as they are variously called:

| Diameter of Wheels | Minimum Grinding Surface Sq. in. | Minimum Diameter Branch Pipe in ins. |
|---|---|---|
| 6 in. or less, not over 1 in. thick | 19 | 3½ |
| 7 to 12, not over 1½ in. thick | 57 | 4 |
| 13 to 16 in., not over 2 in. thick | 101 | 4½ |
| 17 to 20 in., not over 3 in. thick | 189 | 5 |
| 21 to 24 in., not over 4 in. thick | 302 | 5½ |
| 25 to 30 in., not over 5 in. thick | 472 | 6½ |

Buffing wheels 6" or less in diameter used for jewelry work may have a 3" branch pipe.

The thickness given for buffing wheels applies to the thickness of the wheel at the center. In case the wheel is thicker than given in the above tabulation, it must have a branch pipe no smaller than is called for by its grinding surface.

3. Branch pipes must be not less than the sizes specified above throughout their entire length.

4. All branch pipes must enter the main suction duct at an angle not exceeding forty-five degrees (45°) and must incline in the direction of the air flow at junction with main.

5. Branch pipes must not project into main duct.

6. All laps in piping must be made in the direction of the air flow.

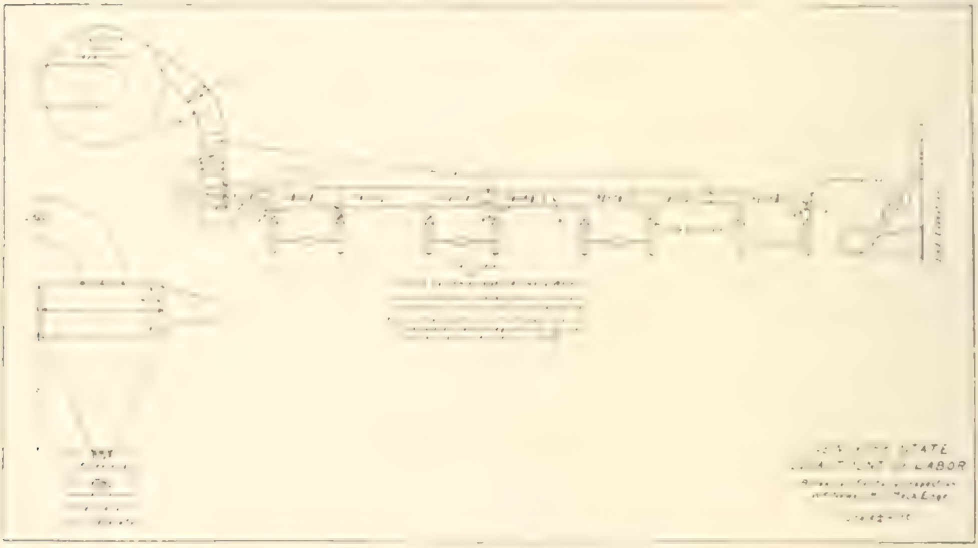
7. All bends, turns, or elbows, whether in main or branch pipes, must be made with a radius in the throat at least equal to one and one-half times the diameter of the pipe on which they are connected.

8. The inlet of the fan or exhauster shall be at least twenty per cent (20%) greater in area than the sum of the areas of all the branch pipes and such increase shall be carried proportionately throughout the entire length of the main suction duct, i. e., the area of the main at any point shall be at least twenty per cent (20%) greater than the combined areas of the branch pipes entering it between such point and the tail end or dead end of the system. If such increase is made greater than 20%, the area of the main at any point, except that portion of it between the branch entering

nearest the fan and the fan, shall bear approximately the same ratio to the combined areas of the branches preceding that point (i. e. between it and the tail end of the system) as the area of the main at the branch nearest the fan bears to the combined areas of all the branches. (This provision is made to permit the use of a fan having a larger inlet area than the area of the main at the branch pipe nearest to the fan, if desired.)

9. The area of the discharge pipe from the fan shall be as large or larger than the area of the fan inlet throughout its entire length.

10. The main trunk lines, both suction and discharge, shall be provided with suitable clean-out doors not over 10 feet apart, and the ends of the main suction duct shall be blanked off with a removable cap placed on the end.



Exhaust System for Use With Eight 14 inch Emery Wheels.

11. Sufficient static suction head shall be maintained in each branch pipe within one foot of the hood to produce a difference of level of two inches of water between the sides of a U shaped tube. Test is to be made by placing one end of a rubber tube over a small hole made in the pipe, the other end of the tube being connected to one side of a U shaped water gauge. Test is to be made with all pipes open and unobstructed.

12. Plans for all exhaust system installations, showing location and sizes of all wheels, hoods, main and branch pipes, fan and dust separator should be submitted to this Department in duplicate for approval before work is begun, and it must be clearly specified that the system is to be installed in accordance with the specifications. The test previously specified must be obtained before the system will be acceptable by this Department.

In addition to the preceding specifications, *which are compulsory*, a number of "Recommendations" are herewith given, which, if observed, will make for still more efficient operation and longer life of the system

*Recommendations*

1. Emery wheel and buffing wheel exhaust systems should be kept separate owing to danger of sparks from the former setting fire to the lint dust from the latter, if both are drawn into the same suction main

2. In case of undershot wheels (i. e., the top of the wheel runs toward the operator) which is almost always the direction of rotation of both emery and buffing wheels, the main suction duct should be back of and below the wheels and as close to them as is practicable, or it should be fastened to the ceiling of the floor below, preferably the former. If behind the wheels, it should be not less than six inches above the floor at every point to avoid possible charring of the floor in case of fire in the main duct and also to permit sweeping under it. For similar reasons it should be

at least six inches below any ceiling it may run under.

3. Both the main suction and discharge pipes should be made as short and with as few bends as possible, to avoid loss by friction. If one or the other must be of considerable length, it is best to place the fan not far beyond where the nearest branch enters the large end of the main, as a long discharge main is a lesser evil than a long suction main.

4. Avoid any pockets or low places in ducts where dust might accumulate.

5. The main suction duct should be enlarged between every branch pipe entering it, whenever space permits, and in no case should the main duct receive more than two branches in a section of uniform area. All enlargements in the size of the main should be made on a taper and not by an abrupt change.

6. If there is a likelihood of a few additional wheels being installed in the future, it is advisable to leave a space for them between the fan and the first branch and to put in an extra size fan. Or, a space may be left beyond the fan so that the fan may be moved along and the main extended when it is actually decided to install additional wheels, provided the fan is of sufficient size still to comply with these specifications after the additional branches are added.

7. Branch pipes should enter the main on the top or sides—never at the bottom. Two branches should never enter a main directly opposite one another.

8. Each branch pipe should be equipped with a shut-off damper or blast-gate as it is also called, which may be closed, if desirable, when the wheel is not in use. Not more than 25% of such blast gates should be closed at one time; otherwise, the air velocity in the main duct may drop too low and let the dust accumulate on the bottom.

9. It is very important that the lower part of the hood shall come far enough forward beneath the front of the wheel so that the dust will enter the hood and not fall outside of it altogether, even if the accomplishment of this result necessitates leaving considerable space between the wheel and the lower part of the hood in order that the hood shall not interfere with the work.

10. Branch pipes should lead out of the hood as nearly as possible at the point where the dust will naturally be thrown into them by the wheels. This is very important.

11. An objectionable practice sometimes found where small work is polished is the use of a screen across the mouth of the branch pipe where it enters the hood. Such screens are an obstruction to the passage of material and the ravellings from buffing wheels are held against the screen by the suction, with the result that in a short time the draught is almost entirely cut off.

12. The use of a trap at the junction of the hood and branch pipe is good practice provided it is cleaned out regularly and not allowed to fill up with dust. This will catch the heavier particles and so take some wear off the fan. It will also serve to catch any nuts, pieces of tripoli, etc., dropped by accident, and in the case of work on small articles, will enable them to be recovered when dropped in the hood.

13. All bends, turns, or elbows, whether in main or branch pipes, should be made with a radius in the throat of twice the diameter of the pipe on which they are connected, wherever space permits.

14. Elbows should be made of metal one or two gauges heavier than the pipe on which they are connected as the wear on them is much heavier.

15. The withdrawal of the air from a room by the exhaust system, naturally tends to create a slight vacuum, and for this reason, inlet for air at least equal to the sum of the areas of the branch pipes should be left open.

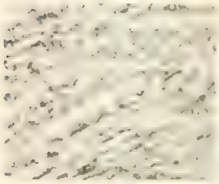
16. Recommendations for the size of the cyclone separator or dust collector, as it is often called, are hard to give, as the separator must be proportioned to suit operating conditions, light dusts requiring a larger separator than heavy dusts. For light buffing dusts, lints, etc., the air outlet from the top of the separator should be so large that the velocity of discharge will not exceed 300 to 480 feet per minute. Then select a separator of which the other dimensions are proportionate. The air outlet should be provided with a proper canopy or elbow to exclude the weather, but should otherwise be unobstructed. There should be ample clearance under the separator for accumulation or storage of the dust which should never be allowed to pile up as high as the bottom of separator.

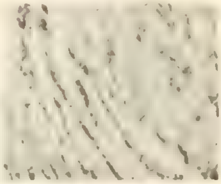
The sketch herewith illustrated shows an exhaust system laid out in conformity with these specifications for eight 14 in. emery wheels.

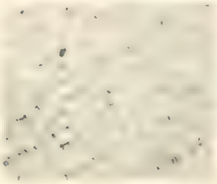
# The Microstructure of German-Silver And Its Relation to Annealing).

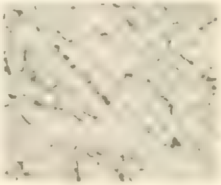
**By O. F. Hudson.**

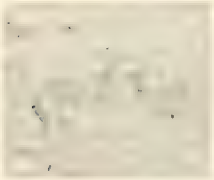
[illegible] pper, [illegible] The general properties and microstruct [illegible] that, like almost all commercial ductile alloys that are rolled and drawn, [illegible]











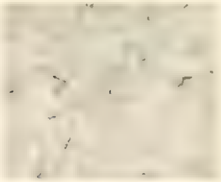


Fig. 1. As Rolled

Fig. 2. Annealed 1 hr. at 720 C.

Fig. 3. Annealed 10 hrs at 700 C.

Fig. 4. Annealed 24 hrs. at 700 C.

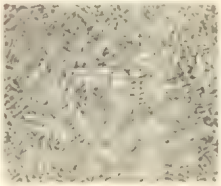
Fig. 5. Annealed 18 hrs at 700° C.

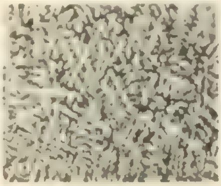
Fig. 6. Annealed 72 hrs. at 700° C.

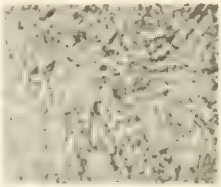
[illegible] r-zinc [illegible]

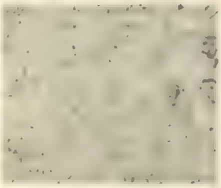
[illegible] n the crystalline structu [illegible] samples were all of the same quality and of [illegible]

Nickel . [illegible]









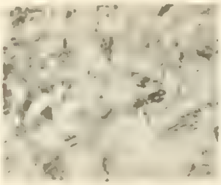


Fig. 7. Cast.

Fig. 8. Cold Rolled.

Fig. 9. Rolled and Annealed 6 hrs. at 720 C.

Fig. 10. Rolled and Annealed 15 hrs. at 720 C.

Fig. 11. Re Rolled and Annealed

Fig. 12. Re Rolled and Annealed.

The samples had been annealed under ordi- [illegible] 700° C. for varying lengths of time. Two series [illegible] the first having annealing times [illegible]

Typical microstructures of the cold-rolled and annealed samples are shown in Plate I [illegible] show that the usual [illegible] alloy still shows very distinct signs of the original cored structure of the cast material. The "cored" structure is still in evi- [illegible] after prolonged annealing, as is shown by Fig. 5, which is the microstructure of the

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[illegible] stract of a Paper Read at the Meeting [illegible] and held in March.

[illegible] Birmingham Universit

sample after 48 hours' annealing at 700°C. After 72 hours' annealing at 700°C. the alloy is practically homogeneous (Fig. 6), although faint traces of the "cores" were observed even in this sample when very slightly out of focus under the microscope. The conclusion that the light and dark shading observed on the etched surfaces of Mr. Boeddicker's specimens was due to the persistence of the original "cores" of the crystals of the cast alloy was confirmed by experiments with an alloy of similar composition cast in the laboratory. The alloy was cast in a small strip mould, and the casting, 7/32-inch thick, was rolled, annealed by heating to about 700°C. for a few minutes, and rolled again to give a strip 1/8-inch thick. The structures of the cast alloy and the final cold-rolled strip are illustrated in Plate II. Figs. 7 and 8. Portions of the cold-rolled strip were then annealed for varying times at a temperature of 720°C., and typical structures of annealed specimens are shown in Plate II. Figs. 9 and 10. Here again the persistence of the "cored" structure is evident. Fig. 9 shows that annealing at 720°C. for 6 hours was quite insufficient to give uniformity of composition, but after 15 hours at this temperature (Fig. 10) the alloy was perfectly homogeneous. The question of whether or not a German silver is composed of a perfectly homogeneous solid solution can be decided by the examination of a suitably polished and etched surface by means of a hand lens, or even by the naked eye; for the presence of any remains of "cores" is shown by a very fine but distinct pattern or gaining which is accentuated by relief polishing, owing no doubt to slight differences in hardness.

The extreme slowness of diffusion in German silver as compared with the corresponding *a* solid solution of the copper-zinc alloys is probably due to the presence of nickel. Diffusion appears to take place equally slowly in cupro-nickel, as is shown in a series of photomicrographs of the structure of that alloy which were published by Bengough in his recent paper on the properties of alloys at high temperatures. An examination of those photographs indicates that annealing for an hour at a temperature of 800°C. was insufficient, and that the same time at 900°C. was required to make the alloy homogeneous.

It may be of interest very briefly to note here the results of a few preliminary experiments made to determine the effect of heat treatment on the properties of German silver.

*Rolling Qualities.*—Annealing for 10 minutes, 100 minutes and 10 hours at 800°, 850°, and 900° C. in all cases gave specimens that were found to roll easily and well, and the same result was obtained after annealing for half an hour at 950° C. and 1000° C. All these annealings were carried out in air in an electrically-heated tube furnace, while a specimen annealed for 2 hours in an atmosphere of coal-gas at 850° C. also rolled perfectly. A portion of the specimen whose structure is shown in Fig. 10 was also rolled with satisfactory results, and on again annealing for a short time at 750° C. the structure of the alloy was, as shown in Plate II. Fig. 12, one that indicates no deterioration in mechanical properties. It thus appears that a coarse crystalline structure due to prolonged or drastic annealing is in itself no sign of inferior rolling qualities.

*Hardness*—The original series of specimens supplied by Mr. Boeddicker were tested by means of the Shore scleroscope, and the results, of which a selection is given, show that prolonged annealing accompanied by pronounced crystal growth does not lead to any decrease in hardness beyond that due to the normal annealing operation.

| | Hardness Number |
|---|---|
| As Rolled | 60 |
| 1 hr. Annealing at 700° C. | 23 |
| 3 hrs. " " " | 23 |
| 10 " " " " | 26 |
| 48 " " " " | 23 |
| 72 " " " " | 26 |

## Cleaning and Preserving Lacquered Goods in England.

While a large proportion of the lacquered goods produced in England are treated with the spirit lacquers by applying them to the heated work, any new departure in the use or treatment of lacquered work is of interest to all who are engaged in lacquering.

The well known firm of Tonks, Ltd., of Birmingham, England have recently placed on the market a new material called "Conservo" intended, they say, for the preservation, cleaning and improving of lacquer. This firm, by the way, is one of the largest manufacturers of brass hardware in Great Britain. They say: "Lacquered articles quickly lose their new, bright appearance owing to the influence of the atmosphere, constant friction by rubbing for cleansing purposes, and the entire [illegible] some gritty or acid material which immediately destroys the remaining lacquer and [illegible]

"There are many articles which, when the [illegible] church fittings and these remain stained and [illegible] the original brilliance is enhanced and [illegible] This preparation [illegible] scientific investigation etc."

[illegible] lacquer is [illegible]

"[illegible] spirits, and applying the solution while the metal is at a high temperature. Heat volatili[illegible] on the metal."

[illegible] market, and it would seem that there might be [illegible] country.

## A Unique Safety Device for Presses.

It is very easy to find, among employees of [illegible] a number whose fingers or thumbs have been [illegible] frequent source of accident, and while, in nearly every case, it is due to the carelessness of the operator, yet it is a thing to be abhorred and any method of guarding against it should be seriously considered.

The Geuder, Paeschke & Frey Co. of Milwaukee, Wis., one of the largest makers of stamped and drawn sheet metal goods in the United States, have recently placed on the market a device for preventing accident to press operatives, and which they call the "Cream City Accident Preventor." It was originally designed for use in their own shops, but it has proved so satisfactory to them that [illegible] that other manufacturers may benefit by it.

The devi[illegible]tically [illegible]

The Safety Device Fitted to a Foot Press.

[illegible] and the punch fails to operate. The device, [illegible]ally "fool proof," a feature [illegible]

The device does not interfere with the out[illegible] without alterat[illegible]

The use of copper for manufacturing purposes in the London consular district constitutes by a small proportion of the total consumption of the United Kingdom. The greater part of the copper is required in the Midlands and the north of England, which contain such great industrial cities as Birmingham, Manchester, Newcastle, Sheffield, and Leeds. Liverpool, by reason of its location, is the port which receives most of the copper imported into the United Kingdom from the United States. Some American copper is delivered at Swansea, but it forms a very small proportion of the total imports.

## Some Aids to Scientific Management in the Foundry.*

By W. M. Corse.†

One of the first steps in the scientific management of a plant, is to plan out a proper organization. This gives every thing a base from which to start and clarifies the atmosphere of petty jealousies and misunderstandings. With this organization chart before us, we can follow out the various departments and finally perfect a harmonious whole.

My own plan is to start a system of factory records in order that the management may have written information of the happenings in the shop at the present time and a record for the future. These may be daily, weekly or monthly reports and should serve to furnish information that will give a mental picture of affairs in a concise manner. We should have these records immediate, adequate and permanent. I shall attempt to describe some of the records I have used with success in a brass foundry:

The first and most difficult report to keep accurately is that of the metal melted and of the output. We may call it the metal report or practice sheet. To secure positive results it is wise to have a separate room in which to store the daily supply of metal for the various mixtures and the shop scrap from each alloy produced. These should be kept in separate bins or boxes properly marked with the alloy number, so that errors in weighing can be minimized. As many alloys look similar, great care should be exercised first in taking the castings from the foundry to the cleaning room and next in taking the gates and risers and defective castings from the cleaning room and inspection departments. In this case, as in all movements of goods in process, the arrangement of the various departments should be such that the metal moves in a direction that does not cross or back track other metal. The tagging of alloys that cannot be readily picked out by their appearance will aid materially in keeping this record accurate. The progressive jobbing foundry will frequently have twenty-five standard alloys, as well as a large number of special mixtures.

Let us follow the progress of the metal and note the steps in the progress.

First the storekeeper weighs out the bulk metals to the foundry metal room, receiving in return a signed requisition from the weighmaster. This requisition serves as a check on the store records and aids the purchasing department in balancing the materials' account with the accounting department at the end of the month. Secondly, the weighmaster weighs out the various amounts of new metals and shop scrap for the mixtures ordered by the furnace department, using the daily working formula given to him by the metallurgists in charge of the laboratory. Before delivering the mixtures to the furnace department, the weighmaster should record on a special ruled sheet, the alloy number, furnace number and the weights of the constituent metals. At the end of the day this sheet goes to the metallurgist to be checked and from there to the cost office for compilation. The totals of these daily sheets for a week give the amount of each alloy charged to the furnace department and when credited with the amount remaining at the end of the week, shows the metal melted for that period. They show not only the amount of the various constituents used in each alloy, but also the total of each metal used for the week. They further show exactly what each furnace is producing.

This information can be used for determining the consumption of metal and gives the purchasing department an accurate figure on which to base future purchases for the maintenance of sufficient stock for the orders on hand.

We now have figures on our weekly summary sheet which may be said to constitute the debit side of the account. The credit side of the account consists of the output of the foundry, divided into ingot metal, good castings, bad castings, gates, risers and recovered metal. They are weighed by the inspection department, the first three coming from the inspection department itself, the fourth from the cleaning room and the fifth from the recovery department. They are separated first by days' work then by alloys. Subtracting the output of each alloy from the metal charged to the furnace department, will give the gross loss of each mixture and the difference of the totals the gross loss of the foundry for the week.

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*A paper read before the Pittsburgh Foundrymen's Association, March 10th.

†Works Manager, The Lumen Bearing Co., Buffalo, N. Y.

The net loss is figured at the end of any period by assaying recovered metal too fine to be returned direct to the foundry, from the metal recovery department, figuring the weight of metal recovered and subtracting it from the gross loss. For cost purposes the net loss by weight cannot be used because the recovered metal cannot be sold for its full value to the smelter. We therefore estimate the value of the metal melted for the period in qu[illegible] divide it into the amount received from the smelter for the recovered metal thus arriving at the percentage of the recovered metal. This is subtracted from the gross percentage loss to be added to the formula cost of the alloy. This is not strictly accurate in that the gross percentage loss by weight may not represent the formula cost of the new metal, but as the more volatile metals are usually cheaper, the error is on the safe side. Let us take an example, viz: The new metal may consist of 85 parts copper, 5 parts tin, 5 parts lead and 5 parts zinc. This would cost on the basis of 50 per cent tin, 4½ cent lead, 15 cent copper and 7 cent zinc, about 15.82 cents a pound. If we are making ingot metal, we would add the approximate net loss of 3%, determined as outlined above, or .47c to 15.82c as the cost of the metals constituting the alloy.

The fact that such a figure does not give the cost of the alloy in the castings is frequently overlooked in cost accounting. Let us see why this figure cannot be used estimating the cost of castings. If we melt 100 lbs. of metal, we may assume in ordinary brass foundry practice that we will net about 45 pounds of good castings. It is apparent that 100 lbs. of metal costs in the formula 15.82c and that we lose 3 lbs. valued at .47c. Therefore, 45 lbs. of good castings would cost 45 x 15.82 or $7.13. Figuring the loss on the value of the good castings, therefore, costs 15.82 (6.6% of 15.82) or 15.82 1.04 = 16.86c per lb. An easy way to determine the amount to be added for loss is to divide 100 by the percentage of good castings produced, in this case 45%, giving a factor of 2.2. Multiplying the net loss of 3% by the factor 2.2 we get 6.6%, which is the same as we determined by the other method. We have now found by the use of the metal report or metal practice sheet, a means of checking the store records, the amount of metal melted, the output and the factors to be used in figuring the value of the metal for cost purposes.

The second record of importance is the daily casting report. The first essential for this report is to have every day's work kept absolutely separate in all departments handling the castings, except the shipping room. There are [illegible] out they are checked for count and customer's [illegible] cleaning room. This record is made in duplicate in the left hand columns of the report and a copy goes to the production clerk, who records the number of pieces made on the shop order, which is a copy of the customer's original order. This in turn enables the production department to keep in close touch with the orders in process. As the castings come from the cleaning room, they are examined in the inspection department and the weight and count of good and bad pieces noted. The good castings pass directly to the shipping department; while the defective pieces are sorted by pattern number and by molder's numbers, on a bench set apart for the purpose. When the day's work is all inspected, the foundry superintendent and factory engineer go over each lot of defectives and note the causes of defect This serves to furnish information for the immediate correction of excessive losses. We all know that one of the big leaks in any foundry is the amount of bad castings, so that the relatively small amount of time spent in their examination will surely lead to large savings It is surprising how frequently this examination is casual, instead of systematic and it generally needs a cost record to emphasize the amount of the loss through defective castings before much attention is paid to this feature. A bonus paid to the foremen when the percentage of defectives drops below a stated amount, will often stimulate interest in this matter. The inspection department records the number and weight of the good and bad pieces opposite the count noted by the foundry clerk on the daily casting report and the percentage of defectives, by pieces, is calculated. This report is arranged by molder's number so that it will show the foundry superintendent and factory engineer the quality of work being turned out by each molder. A compilation of the daily reports for the week will show the percentage of loss by each molder, and the weight of castings produced. The latter when divided by the number of working hours will show the pounds produced per molder per day for the week. This serves as an excellent check on each molder's efficiency. Another compilation will show the total castings produced per alloy by weight and pieces and also the total weight and pieces for the week. This is the source of part of the information regarding output which was mentioned under the metal report in the first part of the paper. From the total weight and pieces is figured the average weight of the castings produced and the total defective loss in percentage by weight and pieces. This gives a good general idea of the efficiency of the foundry department when taken in connection with average pounds produced per molder per day.

When a job is of sufficient length to make it advisable, the record of the defectives may be kept on cards arranged by pattern numbers. The average of a period points out the excessive defectives and indicates the patterns to be improved immediately, in order to gain maximum benefits.

The third set of records that I might mention, are the individual cards showing the exact time spent on each job. On these cards are entered the weight and count taken from the daily casting reports, thus giving a complete record of the job to be used as a basis for figuring its cost. The various items of expense chargeable to each job are taken from the expense analysis of the month preceding. This expense analysis is made up from the pay roll, which has been subdivided by job or standing plant order numbers, and the various items of expense are taken from the store room requisitions and the voucher register in the accounting department.

To summarize we have the sources of information for the three items of cost, viz:

MATERIAL, LABOR and EXPENSE.

FIRST—The metal report which gives the cost of material.

SECOND—The individual cost cards which give the labor on each job.

THIRD—The expense analysis which gives the items of expense chargeable to each hour of productive labor of each pound of castings produced, depending on which method is followed in figuring the expense in the department in question.

In order to scientifically manage any business, the basic facts which underlie it must be known. As a step in this direction, the reports mentioned above will serve to give fairly complete information. Many others can be added to give specific information, such as figuring piece work rates and standard time and bonus rates, but these should, in my opinion, follow those first mentioned.

## The Heat Treatment of Gun-Metal.

The success that has followed the heat treatment of steel has led investigators to endeavor to ascertain whether similar effects cannot be obtained on the non-ferrous alloys. At the March meeting of the British *Institute of Metals,* H. S. and J. S. G. Primrose read a paper on "The Practical Heat Treatment of Gun Metal" and which is of value as a contribution to our knowledge of the heat treatment of the bronzes.

The gun-metal used (Admiralty gun-metal) consisted of a mixture like our own Government bronze and which contains:

| | |
|---|---|
| Copper | 88% |
| Tin | 10% |
| Zinc | 2% |

The authors say that it is difficult to obtain castings which will fulfill the requisite physical tests. These are:

| | |
|---|---|
| Tensile Strength | 31,360 lbs. sq. in.<br>(14 Tons) |
| Elongation | 7.5%<br>(on a 2 in. test bar) |

Many practical founders, they say, have experienced trouble in making sound castings from this mixture to stand a high water pressure; and undoubtedly the internal structure of the metal has a great deal to do with this important property, as well as with its other characteristics. Although blowholes are the commonest source of unsoundness in gun-metal, these may be entirely absent and still the castings are not completely satisfactory when submitted to the physical and hydraulic pressure.

The results obtained by the author were as follows:

1. The tests show that no improvement may be expected by quenching, which lowers the strength of the material.

2. Simple annealing of the metal for 30

minutes very considerably increases its strength and elongation, the maximum results being obtained after annealing at 700°C.

3. The homogeneity and other physical properties of the metal are correspondingly improved, but particularly the capability of the castings to withstand hydraulic pressure.

4. These results are considered to be due to the removal of the eutectic from the microstructure, which after annealing shows only the crystals of *a* solid solution.

5. It is anticipated that this heat treatment will minimise corrosion difficulties.

## The "Crawford" Sectional Oven for Japanning, Lacquering, Bluing, Etc.

For the baking of japans, lacquers or enamels, or bluing steel drying etc., the duties required of ovens are widely divergent, so far as temperatures desired are concerned. Two things, however, are universally sought: Namely, economy of fuel and thorough insulation of oven. In this respect, the "Crawford Sectional Oven," manufactured by the Oven Equipment & Mfg. Co., of New Haven, Conn., has, in its several types, shown high insulation efficiency and marked fuel economy

The heating units of these ovens is the enclosed flame gas burner, adapted to burn city, natural, gasolene or producer gas. Air from a positive blower is forced into the burner and supplies oxygen in such amount as to effect perfect combustion of the gas used as fuel. This feature permits the utilization of every heat unit of the fuel, and makes the enclosed flame gas burner one of the most economical means of converting the gases into available heat units. The air under pressure, after being highly heated in the burner is forced into the oven and there circulates rapidly to all parts. This gives an even temperature throughout as indicated by goods in the most remote part of the oven from burner baking in the same length of time and just as perfectly as articles nearer the source of heat. The rapid circulation of this pre-heated air, promptly removes fumes from surfaces that are japanned or lacquered and ejects them at the oven vents, thereby assuring uniformity of color and bright work. Moisture is also carried away in the same efficient manner.

Heat may be generated with the greatest economy, but if the insulation is such that the heat is not held in the oven, all the economy at the burner goes for naught. In the "Crawford" oven a form of insulation is used which exhibits the maximum efficiency, and though the walls are thin, very little heat is lost.

The sectional construction of all types of this oven allows installation in close quarters, and unskilled workmen may readily erect the largest size and have it working in a few hours. There are no loose parts to hinder the erection.

Contraction and expansion are provided for at all temperatures for which the ovens are rated and there are no openings of the joints. therefore, with the accompanying loss of heat The special adaptability of these ovens for high heat japanning is noteworthy as they have a positive circulation, to remove the fumes, and produce the even temperature so necessary

## A Novel Method of Selling Goods.

A new and novel method of selling goods has recently been instituted by The J. W. Paxson Company of Philadelphia, Pa., manufacturers of foundry supplies and equipment. This method may be used at the works of their patrons or at the most available hotel where a sheet may be hung.

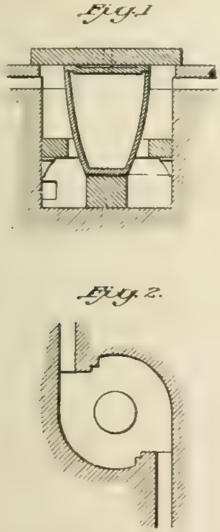
This is accomplished by a new electric stereopticon which may be attached to any electric light socket. Those interested may see the enlarged pictures on the screen, showing in detail the article itself at all points and to [illegible]

The salesman carries this little stereopticon and the slides in his grip, thus enabling him to show and quote the prospective customer almost every article required in the iron, brass or steel foundry, including the buildings, laboratory, pattern-shop, core-room, sand-blast, furnaces, blowers, overhead trolley installation, bellows, riddles, etc. Also the facing mills, machine shops and other departments of the company. In addition, the farms in Rhode Island, New York, New Jersey, Delaware and Pennsylvania, from which the sand, clay and gravel originate, the barges, tug-boats, etc., which are used for carrying these materials direct to foundries along the coast and rivers

Those about to install new equipment will appreciate this new idea as more can be learned about the goods in five minutes than could otherwise be done in a week. The slides are made by the J. W. Paxson Co. and it is believed they are the first to establish this new method of showing goods to prospective customers.

## A Modified Crucible Furnace for Preventing the Cracking of Crucibles.

A modification of the ordinary type of crucible furnace has recently been patented by Regnier Eickworth of Witten, Germany, and which is intended to prevent the cracking of crucibles when heated. The inventor states that cracking is caused by the melting beginning too early in the more elevated parts of the crucible, because the thickness of the wall is much less there than below. The furnace patented and herewith illustrated is intended for burning oil or gas.



The Modified Crucible Furnace.

In order to prevent the cracking, it is necessary, it is stated, to heat it so that premature melting in the upper part is avoided. The manner in which the furnace is constructed is the feature of the invention and may be seen by referring to the illustration. The heating chamber is divided into two parts, a lower and an upper combustion chamber. These two chambers are connected only by a narrow annular chamber around the crucible. When the melting process begins, great heat is produced at first only in the lower combustion chamber, to which the gas or oil is supplied. The heating due to the discharging products of combustion in the upper part will gradually become greater and only in the course of a certain time, which must be such that it suffices for the completion of the smelting process, will the heating be more or less uniform. The section of the upper combustion chamber is made gradually increasing upwardly and the gases generated can be drawn through suitable apertures in the furnace cover.

## The "Bristol" Recording Differential Pressure Gauges.

A new line of recording differential pressure gauges has been developed by the Bristol Company of Waterbury, Conn. Some of these recorders have been in successful use since 1908 and the present instruments are based on such construction. These instruments are intended to record velocities and volumes of air, gas, steam, water, etc., flowing through pipes They may also be employed to good advantage for recording differences and variations of the liquid level in boilers, tanks, kettles etc. Important patents have been granted to Prof

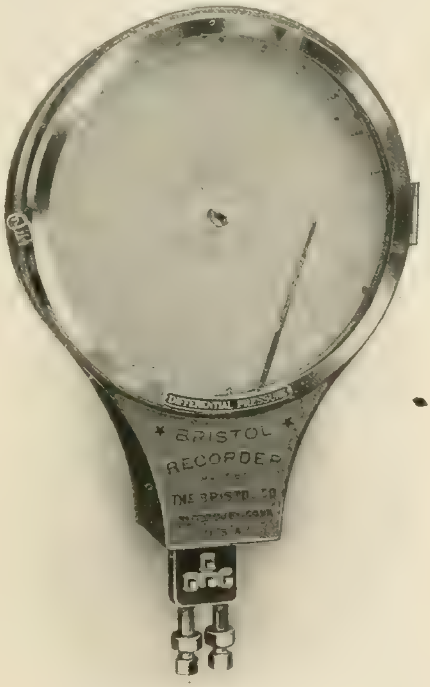


Fig. 1. Bristol's Recording Differential Pressure Gauge.

Wm. H. Bristol, president of the company, upon these instruments.

The instruments are so constructed that no stuffing box is required, but a unique frictionless sealing device is used. In Fig. 2 is shown the interior of the helical pressure tube which has been used with great success on the instrument. One of the pressures, the difference of which is to be recorded, is applied to the interior of this tube through the pipe 24 and the other through pipe 25. The pressure tube 15 is entirely enclosed in the pressure tight casing 22. The movement is transmitted to the pen arm 12. The long tubular sleeve holding the shaft is filled, by capillary action of the liquid which renders the joint pressure tight.

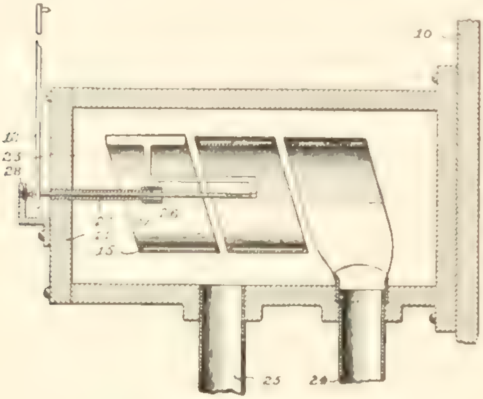


Fig. 2. Interior of Pressure Tube.

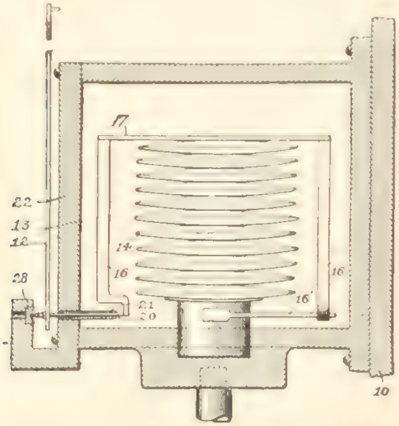


Fig. 3. Interior of Diaphragm Pressure Tube.

In Fig. 3 is shown the interior of the pressure diaphragm tube, and casing 22 which is pressure tight. The diaphragm pressure tube 14 is enclosed in it, and one pressure communicates with the interior and the other with the exterior. The motion is transmitted by the rotating shaft 20 through the sleeve 21 to recording arm 12. This patented device permits the recording of very small differences between the pressure on the inside and the outside of the tube. This frictionless sealing sleeve does not produce appreciable resistance to the rotation of the shaft and the capillary attraction and adhesion prevent leakage, even at high pressures.

The instruments are supplied with a patented safety device consisting of a U shaped tube partly filled with mercury or as may be desired. The length of the tube varies with the range of the gauge. Should the full static pressure by accident be applied to either side of the gauge, the liquid in the safety tube would instantly be forced into one of the enlargements of the tube, thus allowing the static pressure to be applied simultaneously to the inside and outside of the tube and protecting it from being destroyed.

There is a great need for these instruments in many lines of industries and the field for them is rapidly increasing.

## An Improved Method of Molding Car Boxes.

An improved method of molding car boxes or brasses has recently been patented by Charles F. Hopkins, superintendent of the plant of the Ajax Metal Company of Philadelphia, Pa. The object of the process is to avoid hand ramming and hand drawing and to provide, without splitting the pattern and machining the joints, a comparatively inexpensive split pattern that will co-operate with a power molding machine and give satisfactory molds without the use of skilled labor. The method is shown in the accompanying sketches. The molding machine used is preferably of the squeezer type, although other kinds may be employed if desired. The method of making the mold is described by the inventor as follows:

"It will be understood that in most, if not all cases, it will be necessary, in order to make the mold, to employ two boxes which may be used on separate power machines, and of which one makes the cope and the other the drag. The filling of one of these boxes, the one shown in Figs. 3-5, consists of a material which is designated herein as plaster, and of the pattern 17, as of metal, a portion of which projects from the plaster. This material called plaster should be capable of being inserted into the box and thereafter of setting. The filling of the other box, shown in Figs. 6-8 consists of plaster. The pattern 17 may be held in place, if desired, by the tie-rod 18 passing through the bottom of the box, thus the weight of the pattern is carried by the bottom of the box and not by the plaster when the box is inverted. The plaster may be introduced into the boxes through the holes 11, when present. The disposition and arrangement of the thimbles 12 and stools 14 will depend, of course, upon the shape of the patterns and their arrangement in the box.

FIG 2.

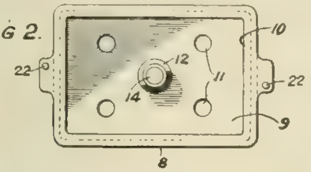
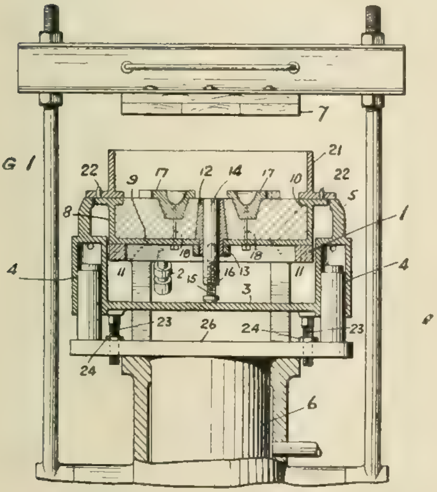


FIG 1



Showing Method of Fitting to Molding Machine.

The face contour of the plaster may be said to be the parting; for example, it will be observed that there are concavities 19, Figs. 3-5, and projections 20, Figs. 6-8, which are complemental and control the parting of the two parts of the mold. The box and the cope or drag 21, as the case may be, are detachably connected by pins passing through suitable holes, *i. e.* by flask guides. As shown the pins 22, are attached to the box, and since they constituted the guides when the fillings of the boxes were made, proper alinement is insured. The box 8, is mounted on or connected with the support 1 and in the making of molds the machine is operated in the ordinary way. Evidently both boxes may contain only plaster in which case both boxes would be like Fig. 7, differing only in the form of that part of the pattern which is effective in respect to the parting line; or otherwise stated, one box would be like that shown in Fig. 7 and the other like that shown in Fig. 5, but with all parts there shown constructed of plaster, or both may contain the pattern or portions thereof and plaster, in which case both boxes would be like Fig. 5, except that the shape of the part of the pattern effective in respect to the parting line, would be different. The depth of the box should be fixed with regard to the work in hand, so that in practice the boxes are or may be of different depths. In consequence of this it is desirable to provide for alining the flask frame 5 with the parting surface or top of the box when the parts are in ramming, squeezing, or jarring position; for this purpose adjustments are provided and the screws 23 and lock-nuts 24 interposed between the part 3, and the part 26 which is raised by the piston 6, are examples of such adjustments.

FIG.3.

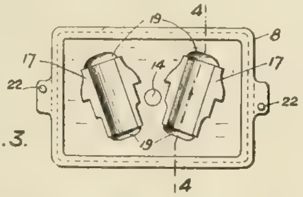


FIG.4.

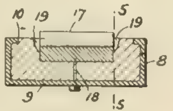


FIG.5.

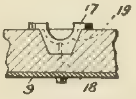


FIG.6.

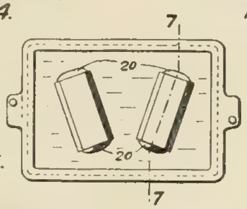


FIG.7.

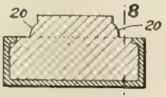


FIG.8.

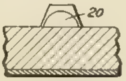
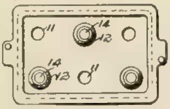


FIG.9.



Manner of Making the Pattern.

# Questions and Answers.

Question No. 1276. In replating old steel table knives, I am at a great disadvantage because I cannot get the fine emery scratches out of the blades What is the matter with my method?

*Answer.* Your difficulty is that your emery is too coarse. You are probably trying to cut down the blades so that the pits and scratches, originally in them, can be removed and the knives left suitable for replating. You will have to use another operation with finer emery to remove the marks of the previous emery treatment. You will probably obtain what you want by the use of [illegible] emery on a leather wheel. You will not be able to obtain as high a finish as though the knives were not to be plated, but left polished. You will have to use two grades of emery in two operations if the steel is badly pitted, but if not, then the [illegible] emery treatment will probably suffice.

Question No. 1277. We have recently had several orders for brass castings with the "sand-blast statuary-bronze finish." We grind the bronze with 120 emery, then sand-blast and give a light coating of copper in a copper plating solution. The castings are then dipped into a warm solution of liver of sulphur until colored, after which they are scratch-brushed with a brass wheel. Now we seem to get too dark a finish, or if not, and we do not leave them in the solution long enough, the color is red and too light. Can you advise us how the right color can be obtained?

*Answer.* You can obtain the shade you desire from the liver of sulphur solution. Do not use too strong as it will work too rapidly and you will obtain too dark a color. Use half an ounce of liver of sulphur or less to a gallon, and leave the work in it until the right shade, then remove, rinse and dip in dilute muriatic acid to set the color. This acid is made by adding 1 pint of muriatic acid to 1 gallon of water. The use of this acid will prevent the color from growing darker while finishing. Then dry and scratch brush. The problem is to take the article out of the liver of sulphur before it becomes too dark. It is better to remove when too light and then remove, rinse and scratch-brush. If too light still, immerse again and repeat until the right shade has been obtained. A little practice will enable one to obtain the right color the first time.

Question No. 1278. We are starting in the business of making aluminum castings and find that it is recommended to pour the aluminum "cold." We have made brass and composition castings for many years and have always had the best results by pouring them "hot." Have we been rightly informed about pouring the aluminum?

*Answer.* Your instructions have been correct. Aluminum and its alloys have different properties from the ordinary brasses and bronzes and require pouring at as low a temperature as possible in order to obtain the requisite tensile strength. If poured hot the castings will be weak. This, of course, is contrary to the practice of pouring ordinary brass or bronze, but is, nevertheless, a fact. If you desire to make good, strong aluminum castings, you will have to use care in melting the aluminum and pouring it at as low a temperature as possible. Just what this pouring temperature is, will have to be determined by the character of the casting, but the heat should be just enough to run the [illegible].

Question No. 1279. Please give us a formula for plating iron and steel with aluminum?

*Answer.* Aluminum cannot be deposited upon metals. All solutions that could be used for this purpose will give no deposit at all. What you have in mind is probably electro galvanizing which, when first done, has an appearance not unlike aluminum. In fact it is customary to add sulphate of aluminum to the solution for [illegible] the zinc. The aluminum, however, does not deposit at all, but is advantageous only in producing a smooth deposit.

Question No. 1280. We have an order for about 5,000 lbs. of rollers, bearings and bushings, [illegible] the following mixture has been suggested:

| | |
|---|---|
| Copper | 50 lbs. |
| Zinc | 40 lbs. |
| Lead | 6 lbs. |
| Tin | 4 lbs. |

It seems to us that this cannot be cast without the use of aluminum and would like your opinion. Is it a standard mixture?

*Answer.* You will be unable to make satisfactory castings of the mixture in sand without the use of aluminum. Add about 4 oz to each 100 lbs. We fear you will have trouble with it on account of the large amount of lead in it. It will probably sweat out. This mixture is very hard and might do for bearings if you can cast it. We have never heard of it before and it cannot be called a standard mixture: in fact, it is, in reality, a "mongrel" mixture.

Question No. 1281. I have a job of elevator enclosure work which is to be colored with a statuary bronze. Some of the work on the enclosure is extrusion metal, some cast bronze and some drawn bronze and sheet bronze. I will have to obtain the same color on all. Can this be done without plating?

*Answer.* We think you will have trouble The extrusion metal will bother you. This is composed of 55% copper and 45% zinc, while the sheet and tubing of bronze is 90% copper and 10% zinc. We do not believe you can obtain a satisfactory color without copper plating the extrusion metal. This will give you the desired results. The drawn or cast bronze will not bother you.

Question No. 1282. In tinning meat choppers, it is customary to use tallow on top of the melted tin. This enables us to obtain a bright, smooth coating of tin on them. The tallow becomes black and useless, after a time, and has to be thrown away. Is there any method of refining it so that it can be used again? Is there much tin in it?

*Answer.* We fear you will not find it expedient to attempt to reclaim this tallow. It has become carbonized so that it has really become a different substance and as far as known it cannot be utilized. Possibly soap manufacturers might use it, but only for a very cheap grade of soap. This point, however, would have to be ascertained by a trial. The statement, of course, is only a suggestion and as far as we know it has not been tried.

Question No. 1283. What is the advantage of running a nickel solution hot and what are the disadvantages?

*Answer.* The advantage gained in using a hot nickel plating solution is that the nickel deposits faster and is brighter. In addition, the nickel is apt to be slightly softer and more free from pits. Beyond these advantages, a hot nickel solution has no other benefits. The disadvantages are the fact that the solution must be heated and requires far more care and must be maintained at a constant temperature in order to obtain uniform results. Cold plating solutions are always used whenever possible and in the case of nickel solutions, it is generally considered that the slight advantage gained by using them hot does not warrant the extra labor involved. It is possible to obtain sufficiently good results in cold solutions of nickel.

Question No. 1284. We are experimenting to produce a cheap white metal that can be polished and will have the appearance of block tin. There is no strength required, and except that it might spoil the appearance, there is no objection to porosity. Can you suggest any mixture that can be used and cast in sand?

*Answer.* We suggest the following mixture for your purpose:

| | |
|---|---|
| Zinc | 85 lbs |
| Tin | 10 lbs. |
| Copper | 3 lbs |
| Aluminum | 2 lbs. |

This mixture can be cast in sand and will have a white color when polished, but not as white as tin. There is no common metal except aluminum that approaches tin in whiteness.

Question No. 1285. What composition is used for polishing sheet aluminum, such as cooking utensils, etc. I have tried rouge but it does not give a good "color".

*Answer.* Tripoli is generally used for this purpose and has been found satisfactory. There are a number of grades of tripoli composition and one should be obtained that does not contain too much ground quartz as this is used in the compound for imparting quick cutting qualities. The results are not as good on aluminum as it does not give as good a "color" as tripoli without quartz. A straight tripoli will give the best results.

Question No. 1286. How is manganese-copper made? Is it made from pure manganese?

*Answer.* Manganese-copper is made in two ways: First, by reducing oxide of manganese (black oxide of manganese or Pyrolusite) by charcoal in presence of shot copper in an electric furnace. The manganese is reduced to the metallic state and combines with the copper forming manganese-copper. This method gives the best grade of manganese-copper. Second, by melting pure manganese and copper together. The pure manganese is made by reducing oxide of manganese by aluminum. This is known as the Goldschmidt process. Such manganese, however, contains a small quantity of aluminum which renders it objectionable for some purposes.

Question No. 1287. We wish to plate a thick copper coat on sheet iron over a tin coat, either by dipping the tinned sheets or electroplating. What is the method that we can use?

*Answer.* You cannot coat the tin sheet with copper by dipping as the copper will alloy with the tin and remove it, when the sheets are dipped in molten tin. The only way is to electroplate the tin. You will have to use the regular cyanide copper plating solution for this purpose.

Question No. 1288. What is "Prime Western Spelter" supposed to be?

*Answer.* The name of Prime Western Spelter has been derived from the designation used for a good grade of spelter made from Western ores. According to the specifications issued by the American Society for Testing Materials and which are now accepted as standard, Prime Western Spelter must not contain over 1.50% of lead and 0.08% iron.

Question No. 1289. What is a good stop-off varnish for both white and black nickel?

*Answer.* A very satisfactory stop-off solution for both white and black nickel is a gum-guaiacum varnish. This is made by dissolving the gum in wood alcohol until it is sufficiently thick (it will not require a very heavy varnish), straining or filtering out the sticks and dirt and coloring with analine blue or pink so that it can be seen on the work. It is painted on the parts to be stopped off and dried rapidly. To remove, the alcohol can be used, or the article dipped in the lye kettle for a second or so. The gum is quite soluble in alkalies.

Question No. 1290. Is a flux used in melting nickel for the manufacture of nickel anodes? If so what is its composition?

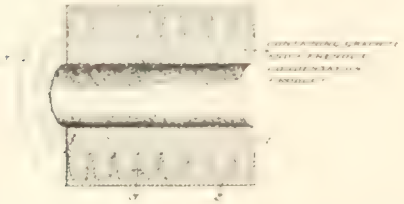
*Answer.* Nickel anodes are not composed of pure nickel but contain small quantities of iron and tin. Some makers use no flux at all. One maker uses the following flux:

| | |
|---|---|
| Lime | 2 parts |
| Fluor-Spar | 1 part |

The lime is slaked, in the manner used in making mortar, and the pulverized fluor-spar mixed in it. The whole is allowed to set and then is broken up into pieces for use. This flux is excellent for use in melting old anodes which are quite dirty. Borax is also an excellent flux.

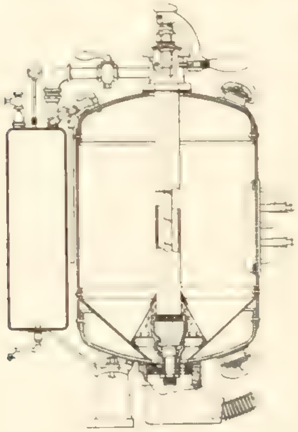
# Patent Abstracts.

1,054,265, Feb. 25, 1913. ANTI-FRICTION DEVICE. Leo Baekelund of Yonkers, N. Y. Assignor to the General Bakelite Co. of New York City. A bearing for anti-friction purposes which consists of bakelite with which has been mixed graphite, and the whole molded into shape. It is then held in a metal shell

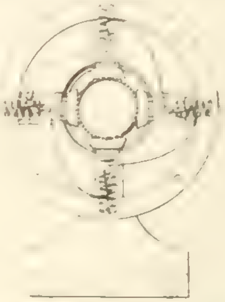


1,056,031, Mar. 18, 1913. FIRE CLAY SUBSTITUTE. Peter Kinander of Charleston, Miss. A mixture of materials to be used as a substitute for fire-clay in furnace lining. The material is composed of the following: Blue pottery clay, 1 part; common salt, ½ part; ashes, ¼ part; fine sand, ¼ part; glass, ⅛ part. The mass is ground and mixed with water for use

1,054,775, Mar. 4, 1913. SAND BLAST APPARATUS. Foster J. Hull of Brooklyn, N. Y. Assignor to the Thomas W. Pangborn Co. The invention comprises an improved sand-container and improved sand and air mixing device. These together with a new form of valve for controlling the delivery of the sand from the container are the essential features of the patent specification. The sand delivery valve is so designed that the parts subjected to wear may be renewed easily

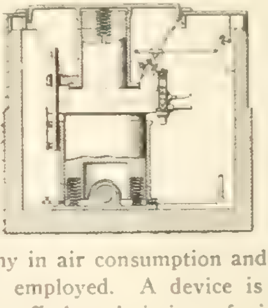


1,05[illegible], Mar. 18, 1913. TUBE [illegible]ING DEVICE. Meier Piersteien of Brooklyn, N. Y. Assignor to Samuel Weisglass of New York. An appliance for producing a transverse satin finish on brass tubing such as those used for bedsteads. The tube is fed into a rotating head containing four polishing wheels which are used for producing the desired finish on the surface of the tube

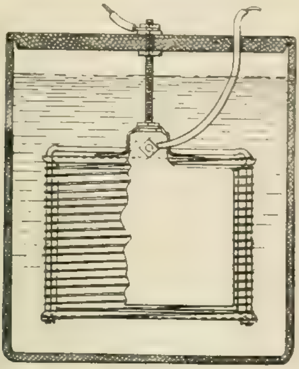


1,056,069, Mar. 18, 1913. CARBORUNDUM COMPOSITION. Lucien Surmont and Joseph Montocol of Paris, France. A process for molding carborundum for use as stair ways, floors and other similar articles which are to possess non-slipping qualities. Carborundum is mixed with cement for this purpose, and also with an additional mixture of sawdust, cork, or asphalt as the case may warrant

1,055,336, Mar. 11, 1913. MOLDING MACHINE. Wilfred Lewis of Philadelphia, Pa. Assignor to the Tabor Mfg. Co. of the same city. The invention relates to the type of molding appliances known as "jarring machines." The features of the invention lies in the economy in air consumption and the valve mechanism employed. A device is employed for cutting off the admission of air prior to the time when the mold support reaches the upward limit of its movement. A number of other improvements have also been made on the machine

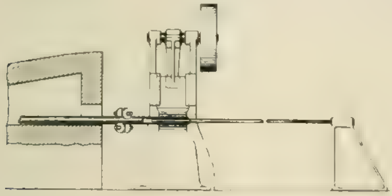


1,055,561, Mar. 11, 1913. GALVANIC BATTERY. Charles B. Schoenmehl of Waterbury, Conn. A battery in which oxide of copper is used for the negative element and zinc for the positive. The improvement consists in the manner of supporting the oxide of copper element to prevent its disintegration should it become cracked or broken.



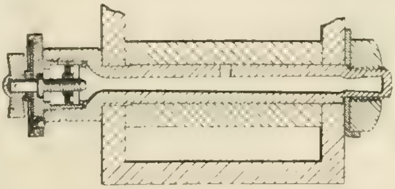
1,056,695, Mar. 18, 1913. METHOD OF CONSTRUCTING DUCTILE METAL ARTICLES FOR ATTACHMENT TO WOODEN OR OTHER BODIES. Francis Oscar Kroll of Camden Town, England. A method of fastening metal molding to the sides of automobiles or other vehicles. The molding is punched for screws, leaving a burr at the top of the hole. The screws are then inserted and the burr hammered down leaving the surface flush.

1,056,326, Mar. 18, 1913. MANUFACTURE OF SEAMLESS TUBES. Samuel E. Diescher of Pittsburgh, Pa. A method of making seamless metal tubes by piercing. The object of the invention is to obviate the formation of an uneven thickness of walls. The billet is pierced while hot, of course, and is rotated while being forced against the mandrel.

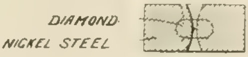


1,055,652, Mar. 11, 1913. ELECTROLYTIC PROCESS. Charles J. Reed of Philadelphia, Pa. The process relates to the electrolytic deposition of iron from its sulphate solution. The object is to recover iron. An anode of "spongy lead" is used which serves to prevent the formation of free sulphuric acid in the solution.

1,054,669, Mar. 4, 1913. PROCESS OF MAKING A COMBINED BOLT AND GREASE CUP FROM SHEET METAL BLANKS. Geo. W. Bowen of Auburn, N. Y. A process of making a combined bolt, for use in holding the springs of automobiles. This bolt is made with the grease cup formed at the end so that the whole is one solid piece of metal. Ordinarily the grease cup and bolt are separate. The method of performing the press work is the novelty of the invention and is unique. Soft steel is used for the purpose and the whole drawn up in a number of operations.



1,056,555, Mar. 18, 1913. WIRE DRAWING DIE. Frederick Krause of Jersey City, N. J. A diamond wire-die for drawing fine wire. The feature of the die lies in the manner of making the mantle or ring which holds the diamond. This is made of an alloy of one-third nickel and two-thirds steel. The alloy is cast around the diamond. The advantage of the nickel steel is that it has less expansion, when the die becomes hot, and the diamond is held more firmly in place, and it is not acted upon readily by acids or water through which the wire may be drawn to cool it.



1,056,694, Mar. 18, 1913. METHOD AND APPARATUS FOR MAKING WIRE DRAWING DIES. Frederick Krause, of Jersey City, N. J. A method of making diamond dies for wire drawing. The process applies to the manner of casting the mantle or ring of metal around the diamond. Two thin metal tubes are used to hold the diamond in place. These allow the hot air to escape and prevent the metal from entering the hole in the diamond.

1,056,125, Mar. 18, 1913. METHOD OF TREATING METALS. Auguste J. Rossi and William F. Meredith of Niagara Falls, N. Y. Assignors to the Titanium Alloy Co. of the same place. A method of treating ferro metals which consists in adding carbide of titanium for the removal of impurities, such as oxygen, nitrogen, etc

# Trade Items.

[illegible] King Bronze & Aluminum Foundry Co. of Cleveland, Ohio. The foundry, it is stated, will be on the present site at 1730 East Thirty Seventh St.

The United States Auto-Lock Company has been incorporated in Findlay, Ohio with a capital [illegible] hardware [illegible] and E. B. Brokaw is the secretary

The New [illegible] of New York City, manufacturers of polishers', platers', and grinders supplies and machinery, are to move on May first to 210-212 Canal St. They are now located at 85 Center St.

Some additions to the plant of the Aluminum Foundry Co. of Sebring, Ohio are shortly to be made. This company was recently purchased [illegible] kiss of Alliance, Ohio.

Kester Barr has resigned his position [illegible] York City and has been made manager of the plant [illegible] Toronto, Canada to succeed Fred Ganderton who recently resigned.

The business of the Meaker Company of Chicago, Ill., manufacturers of electrogal- [illegible]

[illegible] plated goods, etc., have formed a new company [illegible] will manufacture the same line of goods in [illegible] pany is $25,000 and L. G. Proctor is the pr[illegible] dent.

[illegible] turers of lacquers, that has followed the [illegible] for a new, large factory at Wallington, N. J which is to be equipped with the most modern appliances for manufacturir[illegible] appliances for lacquer making and the manufacture will be under the direct supervision of chemists. Branch supply houses are to be maintained from which the trade can be supplied and in a manner better than could be done by jobbers. The new factory will have a capacity of 5,000 gallons per day so that the largest consumer, as well as the smallest, can be taken care of. Porcelain lined tanks, automatic mixers, and every modern appliance for the work will be installed

[illegible] Newark, N. J. platinum manufacturers and re[illegible] Murray and Austin Sts. and will cost $73,000

The Wyandotte Tripoli Co. of Miami, Okla [illegible] stock of $300,000 and will develop the tripoli deposits at Wyandotte. A 50 ton plant will be started at first and increased later

The Crum-Wiley Mfg. Co. of Decatur, Ill [illegible] their plant to Peru, Ind. where a new plant [illegible] $50,000.

[illegible] tric Co. of Bantam, Conn., which was recently destroyed by fire, will be rebuilt. This will [illegible] factured.

At a recent meeting of the directors of the Electrolytic Art Metal Co. of Trenton, N. J., manufacturers of silver deposit wares, the following officers were elected: President, F Crane; vice-president and general manager, Stanley Wilcox; secretary and counsel, F. R Brace.

The Fargo Plating & Metallizing Co. has [illegible] Dakota. Job plating and polishing is carried on and Augustine Tuor and Frank T. Nelson comprise the company. The company is lo- [illegible] for re-tinning ice cream and milk cans is to be installed. Mirrors are also re-silvered.

Those who desire a black, anti-rust finish [illegible] all steel and metal parts, should communicate with the Cole Metal Finishing Co., 451 [illegible] for blackening small metal goods. They will be pleased to quote prices on the [illegible] In addition to metal finishing, this company is now manufacturing special cardboard [illegible] goods by parcel-post. They will be pleased to quote prices on these goods.

[illegible] H. M. Lane [illegible] Detroit, Mich., were formally opened on Saturday evening, March 22nd. by [illegible]ption to the Detroit Foundrymen. Re- [illegible] could be baked was baked in a core oven. The [illegible]tories are located at 18 Piquette St. and occupy 5,000 feet of floor space. A specialty of foundry supplies will be made and the testing of sands, (core and molding) fuels and all foundry products will be carried on. Mr. Lane has made a special study of foundry chemistry and in starting the laboratory in Detroit, he has had the support of a large number of manufacturers in that city

A new iron foundry is to be built by the Paxton-Mitchell Company of Omaha, Neb. This company has been manufacturing brass and aluminum castings and also metallic packing.

George C. Davis, 39 South 10th St., Philadelphia, Pa., metallurgical chemist, makes a specialty of analyses and testing of metals, alloys, fuels, foundry products, electroplating supplies, etc. Manufacturers should obtain his terms.

The plant of Thomas Jackson & Co. of Providence, R. I., which recently went into the hands of a receiver, has been purchased by a new concern, called the Dreaver Mfg. Co. The plant is located at 9 Calender St. and the manufacture of plated jewelry is carried on.

The brass foundry of Schutte & Koerting, 12th. & Thompson Sts., Philadelphia, Pa., manufacturers of injectors and valves, was recently damaged by fire. The loss was comparatively small, however, and did not interfere with the business.

The Canadian business of Wm. A. Rogers Ltd. of Niagara Falls, N. Y., manufacturers of silver plated flat-ware, has grown to such an extent that they have decided to start a plant in Canada for the manufacture of their goods. This new plant is to be located in Toronto and a new company, to which all patents, trade-marks, etc. for Canada will be turned over, is to be formed.

Manufacturers who find die work expensive for the production of pierced metal work, should obtain prices from J. W. Colgan & Co., Sudbury Building, Boston, Mass. By their method of piercing metals, in many instances it will be found cheaper than die work. The desire for ornamental work has, heretofore, been held back, to a great extent, in many instances by the cost of dies. Pierced metal, however, can be cheaply made.

The Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa., manufacturers of plumbago crucibles and other plumbago products, have issued a new catalogue describing their products. This is a very attractive book of twenty-one pages in which the sizes of crucibles and other graphite products are given. In addition there is a lot of useful information in regard to the care of crucibles. The catalogue is well illustrated and will be sent to those who desire it.

The stockholders of the Bristol Brass Co. of Bristol, Conn., manufacturers of sheet brass, recently voted to separate the Bristol Brass Company and the American Silver Co. The American Silver Co. has been owned by the Bristol Brass Co. and the two companies have been conducted together. The $200,000 worth of stock of the American Silver Co., the directors voted, is to be distributed among the stockholders of the Bristol Brass Co. at some future time, should it be considered advisable. The American Silver Co. manufacture silver plated ware. Last year a profit of $23,130 was made.

The Lindsay Metal Novelty Works has been incorporated in East Orange, N. J., with a capital stock of $50,000 to manufacture brass and other metal novelties. H. H. Picking, C. O. Geyer and F. E. Ruggles are the incorporators.

The contract has been awarded for the addition to the plant of the American Tube Works of Somerville, Mass., manufacturers of brass and copper tubing. The addition will be 67 x 167 feet and three stories high.

The Louis J. Bergdoll Motor Co., 16th. and Callowhill & 16th. St., Philadelphia, Pa., manufacturers of automobiles have gone into bankruptcy. Liabilities are placed at $25,000 and assets at $150,000.

The Standard Aluminum Company of Two Rivers, Wis., manufacturers of sheet aluminum goods, have decided to establish a rolling mill for rolling sheet aluminum. A two story building, 40 x 160 feet will shortly be erected for this department.

The American Shear & Knife Company of Woodbury, Conn., manufacturers of shears and other kinds of cutlery, which recently went in the hands of a receiver, is to be reorganized. This company is one of the oldest manufacturers of cutlery in the United States

The Pilling Brass Co. of Waterbury, Conn., manufacturers of thin sheet brass, copper, German-silver and other metals, are now located in their new plant on Watertown Road in that city. This plant was recently built by them and gives them additional facilities for rolling. The mill is run by electric power.

The Detroit Testing Laboratory has removed its office and laboratories from 1111 Union Trust Building, Detroit, Mich. to the new building, 674-680 Woodward Ave. More room is now had and with the increased facilities, the laboratory is now able to render even more prompt and efficient service to its clients. Invitation is extended to the public to inspect the new laboratories.

The plant and machinery of the E. R. Thomas Motor Company of Buffalo, N. Y. was recently sold at auction. This company went into bankruptcy a short time ago and the auction winds up the business. Among the purchasers was C. A. Finnegan of the Empire Smelting Works of Depew, N. Y. who purchased "Lot No. 1" for $56,360. It is stated that the auction brought forth the largest collection of business men ever known at an auction sale of this character.

On May 1st. a new company will start in business in Milford, Conn., for the manufacture of etched metal novelties and etched work for the trade. This new company will be known as the Artsman Company and is to take over the etching business formerly carried on by John R. Baynes of Milford, Conn. The New York Office will be at No. 6 Maiden Lane. Mr. Baynes will be the expert for the new company and will have charge of the factory. A particularly high grade of etching is to be done and some very striking art metal goods will soon be placed on the market.

The capital [illegible] ier Motor [illegible] [illegible] has been increased [illegible].

The [illegible] Mass. are to erect a new factory 200 x 200 feet in that city [illegible] for the manufacture of [illegible].

Extensions to the brass department of the [illegible] Metal Company of [illegible] Pa. are being made. A [illegible] department [illegible] is also being started.

It is reported that the Murdock-Shaw Company of Middleboro, Mass. and the Non-Corrosive Metal [illegible] of [illegible], Mass. have consolidated. Both operate brass foundries.

The American Jewelers' Findings Corporation of Pawtucket, R. I. have taken over the business of [illegible] & Sons, Providence, R. I., manufacturers of metal ornaments and jewelers' findings.

The French Mfg. Co. of Waterbury, Conn., manufacturers of brass and copper tubing, are to erect an addition to their plant. This addition is to be [illegible] feet and [illegible] stories high.

The Atlas Die Casting Co. has been incorporated in Syracuse, N. Y. with a capital stock of $[illegible] to manufacture die castings. The incorporators are Frank [illegible], Morey S. Smith and S. G. Schlachter.

A new four story brick factory is to be erected by the Oliver Whyte Co. Inc., in Medford, Mass., manufacturers of ornamental brass, bronze and metal work. The new factory will be located at Hancock St. and Mystic Ave. and will be 100 x 100 feet. This company has, heretofore, been located in Boston.

Those who desire good tanks for electroplating, pickling or other operations incident in manufacturing, should obtain quotations from A. J. Corcoran, Inc. 3 John St., New York City. A specialty is made of tanks for this class of trade and they are of the highest quality. These tanks have [illegible] to give satisfaction.

The Safety Mfg. Co. has been incorporated in Lancaster, Pa. with a capital stock of $100,000 and will manufacture various safety appliances. A brass foundry will be a part of the plant and malleable iron castings also made. The company has acquired the plant formerly occupied by the Independent Foundry Company. The president of the company is A. G. Hostetter.

Attention is called to the safety device for use on presses and manufactured by Geuder, Paeschke & Frey Co. of Milwaukee, Wis. This device can be fitted to any press and absolutely prevents the fingers from becoming injured when the press is worked. The device works automatically and unless the hand or fingers are removed, the punch of the press will not descend. Operatives, therefore, are insured against the loss of fingers or hands. The device is illustrated elsewhere in this issue.

The [illegible] Art Metal [illegible] of Buffalo, [illegible] are making arrangements for the establishing of a Canadian plant in Bridgeburg, Ont.

An addition to the plant of the [illegible] Wire Works of [illegible] is to be made [illegible] which will be 135 x 200 feet, one story high.

The [illegible] Mfg. Co. has been incorporated with a capital stock of $[illegible] to manufacture electrical de[illegible].

The plant of the [illegible] Mfg. Co., [illegible] St., Philadelphia, Pa., manufacturers of coup[illegible] [illegible] damaged by fire on March 24th.

The [illegible] Co. has been incorporated at Maspeth, N. Y. with a capital stock of $25,000 to manufacture tin cans. A factory will shortly be equipped.

Henry Orme's Sons of St. Paul, Minn., brass and iron founders, are to erect an addition to their foundry on [illegible] St. It will be [illegible] feet.

Ostby & Barton of Providence, R. I., manufacturers of solid gold rings, are to build an addition to their factory. This will be located at the works on Richmond St.

The business conducted by Philip Wunderle. 102 Friendship St., Providence, R. I., has been purchased by the Enterprise Chain Company of that city. The business will be carried on as in the past.

The brass foundry of the McKinnon Dash Co. of St. Catherines, Ont. Canada, was completely destroyed by fire on March 8th. A loss of $50,000 followed this fire. The plant will be rebuilt. The company employs 600 hands and manufacture carriage and automobile hardware.

The capital stock of the Wisconsin Aluminum Foundry Co. of Manitowoc, Wis., has been increased from $35,000 to $100,000. This increase has been made to cover the cost of a new plant about to be erected, and which will probably be erected either in Racine, Wis. or Milwaukee, owing to the conditions in Manitowoc not being favorable.

Among the recent installations of the Steele Harvey crucible furnaces made by the Monarch Engineering & Mfg. Co. of Baltimore, Md. is a battery of furnaces in the plant of the United Foundry & Machine Co. of Bridgeport, Conn. and at the works of English & Mersick Co. of New Haven, Conn., manufacturers of automobile hardware. Both these equipments are designed for burning fuel-oil.

B. O. Bowers Company (Chemical Department), 13[illegible] Liberty St., New York City, agents in the United States for "Persels" the celebrated nickel salts for electroplating, are sending out a booklet to the trade describing these salts and the work they will do. The booklet also contains information on electric cleaners of various kinds which they also handle. The booklet contains much useful information and should be in the hands of all platers. It will be sent free to anyone who requests it.

The Moline Scale Co. of Moline, Ill., manufacturers of scales, are to enlarge their brass foundry.

The factory of the Royal Silver Co., of Newark, N. J., has been moved to 75 Nichols St.

The Universal Shear & Novelty Co. of Newark, N. J. are building a new plant at 38 Littleton Ave. at a cost of $8,000.

Jacob Sadek, president of the Progressive Metal & Refining Co. of Milwaukee, Wis., died on March 31st.

Equipment is being purchased for the new mill of the Troy Nickel Works of Albany, N. Y., which has replaced the one recently destroyed by fire.

The Weed Chain Tire Grip of New York City, manufacturers of chains for automobiles, are to move to Bridgeport, Conn. where a new plant is to be erected.

The new factory of the Herschede Hall Clock Co. on McMillan Ave., Cincinnati, Ohio, has been completed and is now being occupied. The manufacture of hall clocks is carried on.

The Ives Modern Bedstead Co. of Cornwall, Ont. Canada, manufacturers of metal bedsteads, are to erect an addition to their plant for the manufacture of bed springs.

A new mill is to be built by the Bronze Metal Co. of Meadville, Pa. This will be of fire-proof construction with 11,000 square feet of floor space.

The factory of the Mueller Brass Works Co. at Sarnia, Ont., is to employ 150 hands and the site comprises 75 acres. This is the Canadian plant of the Mueller Mfg. Co., of Decatur, Ill., and plumber's brass and steam goods will be manufactured. It is stated that the output for the year will be about $150,000.

The Imperial Brass Foundry & Mfg. Co., which was recently incorporated in Painesville, Ohio with a capital stock of $50,000, has purchased the Foyer plant in that city. This plant is located on the Lake Shore R. R. The manufacture of brass castings, plumbers' goods, automobile and railroad castings will be carried on.

The W. S. Rockwell Company, 50 Church St., New York City, the well known furnace engineers and builders, are sending out to the trade their new Bulletin No. 17, describing the various kinds of "Rockwell" annealing, case-hardening, hardening, tempering and heat treating furnaces which they manufacture. This Bulletin will be sent to those interested.

The Ajax Metal Company has recently issued a very complete and extensive catalogue entitled "Logging Car and Locomotive Brasses, Ingot Metals, Babbitt-Metals and Castings for the Lumber Trade." This catalogue contains 81 pages and is extensively illustrated with photographic reproductions of the various brasses used in these trades. It is intended for use in the lumber trades, which use large quantities of bearings, both of bronze and babbitt-metals.

The Chapman Specialty Co. has been incorporated in Canton, Ohio, with a capital stock of $10,000 to manufacture radiator valves.

A new brass foundry is to be built by W. A. Kinne of New Britain, Conn. It will be 40 x 107 feet and two stories high.

The Syracuse Smelting Works, 147 Jewell St., New York City, manufacturers of the Stanley process babbitt metals and solders, are completing an addition to their plant.

A permit has been taken out by the Union Brass & Metal Co. of St. Paul, Minn. for the erection of an addition to their brass foundry and machine shop. This addition is to be 70 x 120 feet and is to cost $12,000.

The G. W. Hayden brass foundry, for the past decade located in Cambridgeport, Mass., has been purchased by the Broadway Iron Foundry of that city and will be merged with it. The brass foundry will be conducted as a part of the latter concern. A strictly jobbing business is carried on.

The Galesburg Writing Machine Co. has been incorporated in Galesburg, Ill., with a capital stock of $100,000. It is stated that the Chicago Writing Machine Co. will be taken over by this new company. The manufacture of typewriters is to be carried on. The incorporators are Charles T. Childers, Harry A. Bates, A. H. Childers and G. H. Bates.

The Gray & Davis Co. of Amesbury, Mass., manufacturers of automobile lamps, have awarded the contract for a new factory in Boston, Mass. This will be located on the Charles River near the Cottage Farm bridge. This company is now engaged almost exclusively on the manufacture of electric lamps for automobiles and electric starting and lighting generators now so extensively used and known as the "Gray and Davis System."

Adolf Neubeck, 216 Fifth Ave., New York City, importer of the celebrated nickel plating salts of Dr. Friedrich Neubeck of Germany, has issued a new and interesting booklet, giving directions for using the various kinds of nickel plating salts sold by him. In addition it contains a large number of testimonials from various concerns which are using the salts in nickel plating. This booklet should be in the hands of all platers and will gladly be sent to anyone who desires it and will furnish his address.

The Metal Treating & Equipment Co. Inc. has been organized in New York City with a capital stock of $100,000 to exploit a patented process for electrogalvanizing. The purpose of the company is to install job galvanizing plants and to equip special plants for customers. It is stated that the electro-galvanizing solution permits any desired amount of zinc to be deposited with a good structure. The officers of the company are: President, Guido M. Sacerdote; vice-president, Lewis Elmer De Neergaard; and secretary and treasurer, Louis A. Freedman. The office of the company is at 1784 Broadway in the United States Rubber Building.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98-99% | lb. | .22 |
| Acid, Acetic, pure, 30% | lb. | .07 |
| Acid, Arsenious (White Arsenic) | lb. | .20 |
| Acid, Benzoic | lb. | .55 |
| Acid, Boracic (Boric), pure | lb. | .12 |
| Acid, Hydrochloric, see Acid, Muriatic. | | |
| Acid, Hydrofluoric, 30% | lb. | .04 |
| Acid, Hydrofluoric, 50% | lb. | .10 |
| Acid, Muriatic, 20° | lb. | .02 |
| Acid, Muriatic, c. p., 20° | lb. | .07 |
| Acid, Nitric, 38° | lb. | .05⅝ |
| Acid, Nitric, 40° | lb. | .05⅞ |
| Acid, Nitric, 42° | lb. | .06¼ |
| Acid, Nitric, c. p., | lb. | .08 |
| Acid, Sulphuric, 66° | lb. | .01¾ |
| Acid, Sulphuric, c. p. | lb. | .06 |
| Alcohol, Wood | gal. | .50 |
| Alcohol, Denatured | gal. | .55 |
| Alum | lb. | .04 |
| Aluminum, Metallic, in Ingots | lb. | .27 |
| Ammonium Sulphate | lb. | .07 |
| Aqua-Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | lb. | .04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | lb. | .06¼ |
| Ammonia Water, c. p. | lb. | .08 |
| Ammonium Carbonate, lump | lb. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | lb. | .12 |
| Ammonium Hydrosulphuret | lb. | .30 |
| Ammonium Sulphate | lb. | .07 |
| Ammonium Suphocyanate | lb. | .50 |
| Amyl Acetate | gal. | 3.50 |
| Antimony | lb. | .09 |
| Arsenic, Metallic | lb. | .10 |
| Arsenic, White (Acid Arsenious) | lb. | .20 |
| Argols, White (Cream of Tartar) | lb. | .31 |
| Asphaltum, Commercial | lb. | .05 |
| Asphaltum, Egyptian (Bitumen) | lb. | .30 |
| Benzine | gal. | .15 |
| Benzol, Pure | gal. | .50 |
| Bismuth, Metallic | lb. | 2.25 |
| Bitumen, see Asphaltum. | | |
| Blue-Vitrol, see Copper Sulphate. | | |
| Borax, Crystals or Powdered | lb | .10 |
| Borax Glass | lb. | .35 |
| Cadmium, Metallic | lb | .85 |
| Carbon Bisulphide | lb | .10 |
| Calcium Carbonate (Precipitated Chalk) | lb. | .10 |
| Chrome-Green | lb. | 50 |
| Copper, Lake, carload | lb | .15¾ |
| Copper, Lake, (case) | lb. | .15⅝ |
| Copper, Electrolytic, (case) | lb. | .15½ |
| Copper, Electrolytic, (carload) | lb. | .15¼ |
| Copper, Casting, carload | lb. | .15⅛ |
| Copper, Casting, (case) | lb. | .15⅜ |
| Copper Acetate (Verdigris) | lb. | .35 |
| Copper Carbonate, dry | lb. | .25 |
| Copper Sulphate (Blue-Stone) | lb. | .09 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | lb | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | lb | .15 |
| Emery Flour | lb. | .04 |
| Emery, F F & F F F | lb. | .03 |
| Flint, powdered | lb. | .01 |
| Flour-Spar | lb. | .01¼ |
| Fusel-Oil | gal. | 3.50 |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | lb. | .30 |
| Gum Guaiacum | lb. | .26 |
| Gum Mastic | lb. | .70 |
| Gum Sandarac | lb. | .35 |
| Gum Shellac, brown | lb. | .50 |
| Gum Shellac, white | lb. | .60 |
| Iridium | oz. | 83.00 |
| Iron Perchloride | lb. | .25 |
| Iron Sulphate (Copperas) | lb. | .05 |
| Lead Acetate (Sugar of Lead) | lb | 15 |

| | | |
|---|---|---|
| Lead, Pig | lb. | .04⅝ |
| Lead, Red | lb. | .12 |
| Lead, Yellow Oxide (Litharge) | lb. | .12 |
| Liver of Sulphur, see Potassium Sulphide. | | |
| Manganese, Ferro, 80% | lb. | .10 |
| Manganese, Metallic, pure | lb. | .75 |
| Magnesium, Metallic | lb. | 1.50 |
| Mercury Bichloride (Corrosive Sublimate) | lb. | 1.15 |
| Mercury, Metallic (Quicksilver) | lb. | .40 |
| Mercury Nitrate | lb. | 1.50 |
| Mercury Oxide, yellow | lb. | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | lb. | .08 |
| Nickel Carbonate, dry | lb. | .60 |
| Nickel Chloride | lb. | .50 |
| Nickel Metallic | lb. | .45 |
| Nickel Sulphate (Single Salts) | lb | .12 |
| Nitre (saltpetre), see Potassium Nitrate. | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Paraffine | lb. | .15 |
| Phosphorus, yellow | lb. | .40 |
| Phosphorus, red | lb. | 1.10 |
| Pitch | lb. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Cloride | oz. | 46.00 |
| Platinum Metallic | oz. | 48.00 |
| Potash by-Alcohol, in sticks | lb. | .50 |
| Potash, Caustic | lb. | .05½ |
| Potassium Bichromate | lb. | .14 |
| Potassium Bitartarate (Cream of Tartar) | lb. | .31 |
| Potassium Carbonate (Pearlash) | lb. | .10 |
| Potassium Chlorate | lb. | .15 |
| Potassium Cyanide | lb. | .25 |
| Potassium Iodide | lb. | 2.25 |
| Potassium Nitrate (Nitre or Saltpetre) | lb. | .10 |
| Potassium Permangarate | lb. | .17 |
| Potassium, Red Prussiate | lb. | .60 |
| Potassium, Yellow Prussiate | lb. | .24 |
| Potassium Sulphide (Liver of Sulphur) | lb. | .15 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | lb. | .70 |
| Pumice, Ground | lb | .05 |
| Quartz, Powdered | lb. | .01 |
| Rosin, Yellow | lb | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz | .59⅝ |
| Silver Nitrate, crystals | oz. | .50 |
| Soda Ash | lb. | .05 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | lb | .15 |
| Sodium Carbonate (Sal-Soda), crystals | lb. | .02 |
| Sodium Hydrate (Caustic Soda) | lb. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | lb. | .45 |
| Sodium Hyposulphite ("Hypo") | lb. | .04 |
| Sodium Metallic | lb. | .90 |
| Sodium Nitrate | lb. | .05 |
| Sodium Phosphate | lb. | .09 |
| Sodium Silicate (Water-Glass) | lb. | .04 |
| Soot, Calcined | lb | .15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | lb | .05 |
| Tin Chloride | lb | .43 |
| Tin, Metallic | lb | .49 |
| Turpentine, Venice | lb. | .35 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal | .15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | lb. | .45 |
| Wax, Carnauba | lb. | .70 |
| Whiting (Ground Chalk) | lb. | .02 |
| Zinc, Carbonate, dry | lb. | .19 |
| Zinc, Chloride | lb. | .12 |
| Zinc, Sulphate | lb | .06 |
| Zinc, (spelter) | lb | 06¼ |

# THE
# BRASS WORLD
# AND
# PLATERS' GUIDE

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## Refined Spelter for Manganese-Bronze.

In making ordinary brass or composition castings, the cheapest grades of spelter are satisfactory. The lead in it does not need to be considered as it is rare indeed that this metal is not introduced in the mixture; and those in which no lead is used like gun-metal (88-10-2) the amount of spelter employed is so small that the lead in it is reduced to an insignificant quantity. For example, in the 88-10-2 gun-metal mixture, 2 per-cent of spelter is used, and if it contains 1 per-cent of lead, then the finished gun-metal would contain only 0.02 per-cent of lead. An amount so small that it need not be considered.

In the case of the so-called manganese-bronze, however, the case is different. Such mixtures contain some 40 per-cent of spelter and if there is considerable lead in it, then nearly half of it enters the manganese-bronze. It will be appreciated, therefore, that the question of lead in spelter to be used for manganese-bronze is far more important than it is in the ordinary brasses or composition.

Lead always affects the physical properties of the brasses and bronzes containing it, and in the manganese-bronzes it will be found to lower the tensile strength, elongation, and reduction in area. It particularly reduces the elongation and the reduction of area. For this reason, if the highest physical qualities are desired, a spelter free from lead or as free as possible should be used in making up the manganese-bronze mixture. It is impossible, of course, to obtain any spelter absolutely free from lead, but the best grades of refined metal will not contain over 0.05 per-cent of lead and it is this grade that should be used in making manganese-bronze.

Common grades of spelter will run 1 per cent in lead and often over this amount. Therefore, if such spelter is used in making manganese-bronze, nearly half a per-cent of lead will be introduced in it. Such a quantity cannot have but a deleterious effect on the bronze and will reduce its physical properties to a considerable extent, so much so, in fact, that it will be impossible to meet some specifications.

The fact that a refined spelter is necessary in making the best quality of manganese-bronze was not appreciated when this alloy was first put on the market, and many persons who attempted to make it were unable to obtain the required physical qualities on the castings. Chemical analysis, however, soon demonstrated that those makers who were able to obtain the high physical qualities on manganese-bronze used a spelter which was very low in lead.

## The Ultimate Effect of the Automobile on the Job Plating Trade.

The job plater has obtained comparatively little business in the past from the automobile owner. The lamps and hardware have been of brass with no plating on them and the owner of the machine has kept them polished himself or had it done in a garage. While some of the smaller parts have been brass plated, they have rarely been brought to any plater for refinishing, but a coat of black paint has been given them. The job plater, therefore, has profited little by the automobile.

The future, however, will see a different condition and it would seem as though the job plater must be the gainer by the change in the metal finish on the automobile as it is now manufactured. The trade demands that all lamps and parts, which were previously left in the natural brass finish, shall now be nickel plated and a car that is without this finish looks out of date. That this custom has become firmly rooted is manifested by the fact that every manufacturer in the United States is now turning out cars with nickel plated lamps and fittings.

Not only will the nickel gradually become tarnished but it is apt to peel and these two things will react to the benefit of the job plater in every town. Contrary to the usual belief, nickel plating will gradually tarnish, although far less readily than brass. If, however, it is constantly polished by means of the metal polishes sold for the purpose, it will remain in good condition longer. The polishing of nickel, however, is a far more laborious and unsatisfactory task than that of brass and many automobile owners find it unsatisfactory. On this acount the lamps and hardware on a car are often insufficiently polished or left completely alone and the result is that sooner or later they find their way to the job plater.

The peeling of the nickel deposit from the nickel plated parts of an automobile is, we regret to say, far more common than it should be. This condition, of course, is the fault of the manufacturer who made them. It is more apt to be the case with nickel plated steel parts than with those of brass. Steel will be more largely used on cheap cars than in the past, for parts previously made of brass, for the reason that the nickel plated steel has the same appearance as brass that has been thus treated and considerably reduces the cost of manufacture.

In addition, lamps and some other parts are partly or wholly finished in black lacquer or enamel. This is constantly peeling or flaking off and the plater will be called upon to refinish them. This he can readily do by means of the excellent air-drying black lacquers now on the market. They can be applied with a brush and if one understands lacquering a very creditable job can be produced and one that will always please the customer.

Some of the makers of high-grade cars are now silver plating their lamps and hardware, and this will have equally as good an influence upon the jobbing plating trade for they will require attention sooner or later.

The effect upon the job plating trade will probably be more pronounced in the future than in the past as nickel plated material has not been upon the market very long. It is practically this year's cars that made the beginning.

Silver seems to stand the effects of the atmosphere better than brass and while it tarnishes, it does not corrode.

# Observations and Notes on the Season Cracking of Brass.

The season-cracking of brass is far more prevalent than the majority of people believe. It is not difficult to find good examples of it, although the majority of people are quite unfamiliar with the appearance or the fact that there is any such phenomenon. It is one of the "diseases" of brass and is not a new ailment, but has been in existence ever since objects have been made of brass sheet.

The season-cracking of brass, so far as known, occurs only on brass or other alloy that has had some work done upon it. The metal must have been rolled, drawn, spun or treated by some other mechanical process. The cast metal which has not been worked at all, is apparently free from it. It is sheet brass articles that give the most trouble, perhaps, because they are more extensive than other forms of this metal, and it is on such articles that season-cracks may be found more than on any other form of brass.

Brass is not the only copper alloy which season-cracks as the tin bronzes and aluminum bronzes are likewise subject to it and examples to illustrate it are herewith shown. The yellow brasses, however, are the ones which are subject to it the most and this alloy seems to be more apt to crack under the right conditions than any other copper alloy. The fact that other copper alloys are subject to season-cracking indicates that the phenomenon is a physical and not a chemical one.

It is believed that the chemical composition of the brass or other alloy is not in any way responsible for its season-cracking, but that the whole question resolves itself into a matter of influences beyond the mixture itself. It may be outside influences, or it may be strains in the metal. In the majority of instances strains are the cause of the cracking, but ammonia and other chemicals evolving it will produce it.

Season-cracks in metals are those which form after the article has been in use for some time or "seasoned". The cracks form spontaneously without any apparent reason and this very fact renders the phenomenon so mysterious and perplexing. It has often been said

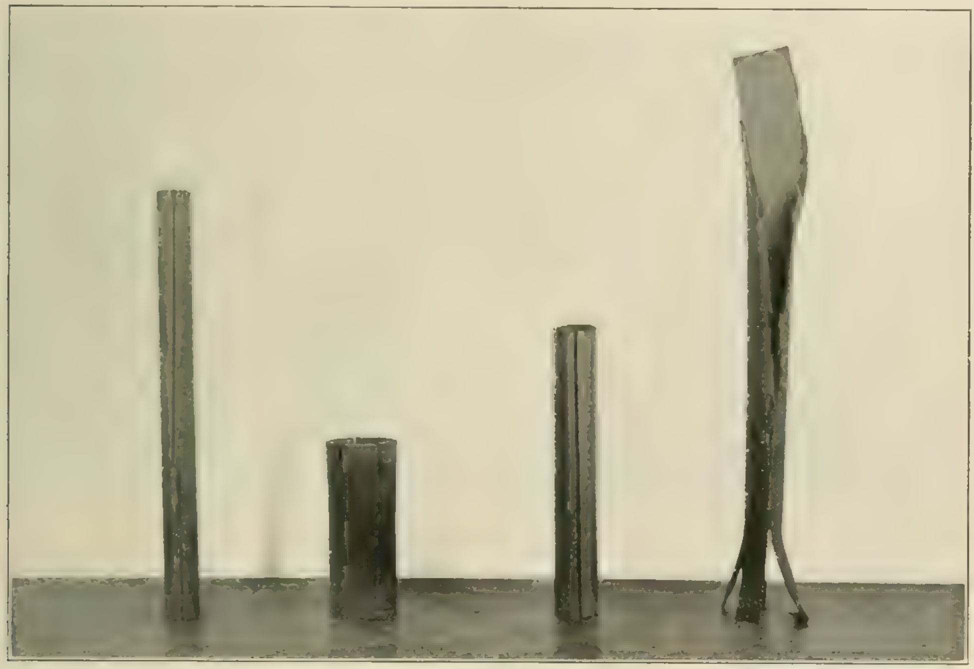

Fig. 1. Aluminum-Bronze Tubing Which Season-Cracked After a Lapse of Some Time.

that season-cracks are the most exasperating and perplexing of all the ills to which brass is subject, for the reason that they occur without any apparent cause and after the brass has been in use for some time. Were it to occur right away after the goods had been made the matter would not be as bad, but to take place after they have been in use and no outside influence brought to bear on the brass, renders the subject more perplexing and mysterious to the user.

When season-cracking has been found on a brass article, the owner may take it back to the dealer from whom he bought it, who in turn sends it to the manufacturer for an explanation. The maker, of course, brings the matter to the attention of the brass rolling mill which turned out the brass sheet or other form. He frequently threatens to bring suit against the mill for damages caused by the cracking of the brass and it seems unquestioned that the fault lies in the brass. The rolling mill proprietor is naturally perplexed and hardly knows what to say or what to do. Here is the case of his brass which cracked open and the evidence is against him. He may adjust the matter with the maker of the goods who used his brass, but he should not have done so as the difficulty is one for which he is never to blame.

As an example of an occurrence such as explained in the preceding paragraph, let the season-cracked acetylene generator shown at the extreme right in Fig. 2 be taken as the case. This was used on the running board of an automobile and after it had been in use for a year or so (possibly less) it developed cracks. The cracks continued to grow in size to such an extent that it finally became useless and was discarded. When, however, the cracks had developed to such an extent that the generator had seemingly become ruined, the owner took it back to the dealer from whom he purchased it with the complaint that it had cracked. The dealer informed him that he had allowed it to "freeze." He had never heard of season cracks.

It is not a difficult matter to find the majority of such generators that have cracked after they have been in use for some time. Many automobiles are equipped with these brass acetylene generators and if one examines those which have been on the car and in use for some time, it will usually be found that they have cracked. As will be previously explained, the cause is the generation of ammonia in the reaction between the calcium carbide and the water used in them. Ammonia, as has been well established, is one of the causes of the season-cracking of brass.

Another example of the way in which brass will season-crack is illustrated in Fig. 3. This is a "Klaxon" horn used on an automobile for two years. The outside shell was of drawn brass. The first year no cracks developed, but after the close of the second year, two good sized cracks appeared and which continued to grow. No influences were brought to bear upon it except the simple action of the atmosphere.

In Fig. 4 is shown a shell of brass made by spinning. Upon standing for several years, small cracks developed. This took place several years ago, and since that time the cracks have grown much larger.

Up to the present time, our knowledge of the causes of season-cracking indicates that there are two which may be recognized as producing it:

1. Strains in the metal of which the article is composed.
2. Ammonia or compounds generating it.

The first or strains in the metal is, by far, the most common cause and it is the one that is responsible for nearly all the season-cracking encountered. Ammonia, however, will produce it and is often the cause of it.

### *Strains in the Metal*

Cold worked metals always have strains in them, of course, and if these strains are uneven, then cracking is apt to result. This cracking may result immediately or after a time, depending upon conditions. Fire-cracking is only a modification of season-cracking and is caused by the strains set up in the metal by the heat. It occurs, for example, on German-silver sheet that has not been "broken-down" sufficiently, or, in other words, by using too light a "pinch" in rolling it. The outside is worked and the inside is not to any extent. The metal, therefore, when annealed has uneven strains set up in it and cracks result. In season-cracking, too, the same thing follows although not immediately. There are uneven strains in the metal and it takes time for them to act. It has been found that drawn metal that is evenly worked will not season-crack unless by means of ammonia.

As the majority of season-cracking is caused by strains in the metal, let it be explained how this can happen. It will be found that drawn sheet brass shells are a very frequent source of this difficulty. The shell is drawn up in a press by means of a punch and die. The relation of the punch to the die may be such that the brass sheet is drawn more on one portion than the other and results in an uneven strain in the drawn shell. This presence of uneven strains is the cause of the season-cracking. Strains may exist in the drawn shell and if they are uniform, no harm results; but if they are uneven, then season-cracking may follow.

The presence of the uneven strains in drawn brass shells is the common source of season-cracks and nearly always, if not entirely, results from imperfect die work in the press. There are two methods, one might say, of making a shell in a press. One is by the simple forming by means of the punch and die, and the other is by actually drawing the shell and stretching the metal. It is the forming of the shell and not stretching the metal that is the dangerous kind of press work. It always results in an uneven strain being set up in the drawn shell. If, however, the shell is actually stretched and the metal worked as much as possible in the press, the strains produced are even and season-cracking is not apt to follow.

The effect of strains in metal as a cause of season-cracks may be illustrated by referring to Fig. 5. This is a piece of 4% aluminum-bronze seamless drawn tubing. The tube was bent over and flattened at the bend, and at the time of the operation, no cracks were visible. On standing, however, the crack seen in the illustration developed. The uneven strain in the metal was the cause.

In Fig. 1 are shown a number of pieces of aluminum bronze seamless drawn tubing which split open on standing, but only after a lapse of considerable time. These samples of tubing were all aluminum-bronze and ranged from 4% to 8% aluminum content. They were made by the Mannesmann process from a solid billet and then drawn cold. The drawing was not carried out properly as the draw benches were not powerful enough to produce any working clear through the metal. The result was that the metal was cold worked on the outside to a considerable extent, but on the inside it received very little. Uneven strains, therefore, existed in the tubes and they season-cracked as illustrated. It is a singular fact that these same tubes, or parts of them, when annealed, fire-cracked in the muffle, and this would seem to indicate that fire-cracking and season-cracking are analagous, although in the case of the fire-cracking they are produced more rapidly.

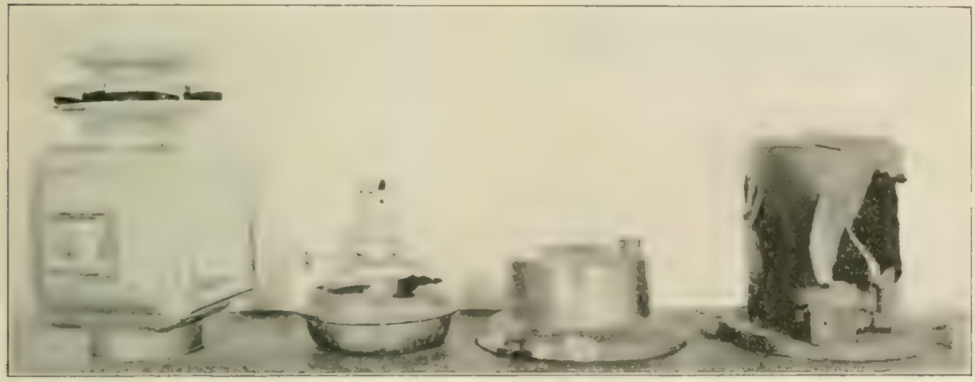

Fig. 2. Brass Goods Which Season-Cracked.

In Fig. 2 is shown an automobile lamp which cracked badly. Both the top, as shown in Fig. 6 and the fount, which may be seen in Fig. 2 season-cracked very badly. This lamp was made of brass and had been in use on an automobile for some time. In Fig.. 2 is also shown a lantern fount which also season-cracked. This was also made of sheet brass. Both these articles were drawn up in a press.

### *Effect of Ammonia*

It has now been well established that ammonia or compounds evolving it will cause brass to season crack. In Fig. 2 is shown an acetylene generator which cracked very badly when in use. Impure calcium carbide, such as now sold for generating acetylene gas gives off ammonia when water comes in contact with it and at the same time that the acetylene gas is generated. This is the cause of the season-cracking. It is not difficult to find very many instances of these acetylene generators which have cracked and it is believed that the ammonia generated from the calcium carbide is the cause.

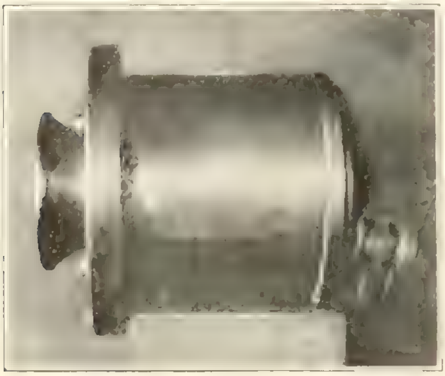

**Fig. 3. Automobile Horn Showing Season-Cracks on Brass Shell.**

Ammonia gas will also cause brass to season-crack, and compounds which generate ammonia upon standing likewise produce it. One of the frequent causes of the cracking is the excretions of animals (which, of course, generate ammonia). When they come in contact with the brass, season-cracking will usually result. Many cases of this kind are on record in which animal excretions have been the cause of the season-cracking of brass.

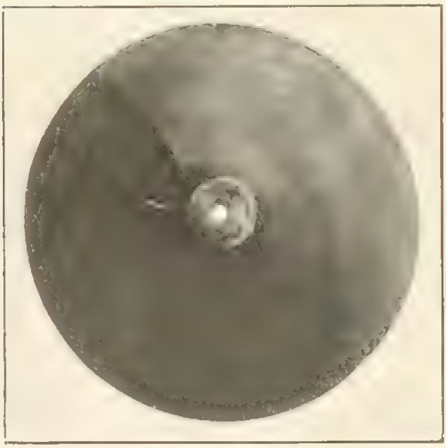

**Fig. 4. Season-Cracks in Spun Brass Shell.**

Why ammonia should cause it, is unknown and it is one of the mysteries of season-cracking. It may be said that crystallization and season-cracking, in the case of brass, seem to be the same as the appearance of the fracture is the same in each case. When brass season-cracks, the fracture is always coarse and crystalline.

### *Summary*

The various causes of the season-cracking of brass may be summed up as follows:

1. That the chemical composition of the brass has no direct bearing of the season-cracking.

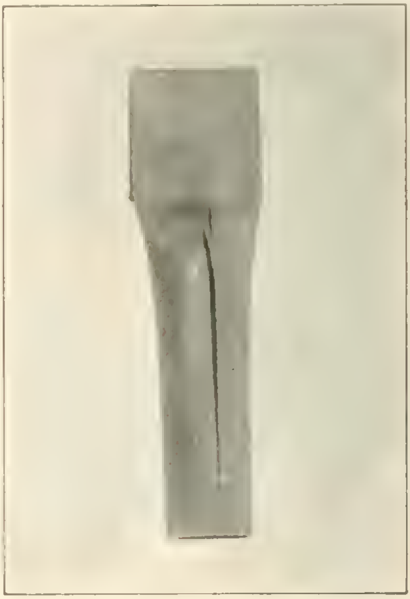

**Fig. 5. 4 Aluminum-Bronze Tubing Season-Cracked on Account of Strains.**

2. That uneven strains are the usual cause and that they are produced by imperfect press work on the brass article.

3. That all copper alloys are subject to it.

4. That ammonia or any compound evolving ammonia upon decomposition will produce it.

5. That season-cracks are more apt to appear in yellow brass than in any other copper alloy.

6. That the brass rolling mill is rarely at fault for the season-cracks and the maker of the brass article in the press is the one who should be blamed except in the case of ammonia when, of course, the user of the brass article is responsible.

In conclusion let it be said that the principal cause of season-cracking is imperfect die work so that internal and uneven strains are set up in the article itself. As one expert manufacturer of brass goods has expressed it, the brass should be "stretched" in the drawing operation and not merely "ironed out" or formed. He states that before this was known, many barrels of drawn brass shells were made by simple "forming," so to speak, and they all season-cracked within a few days on standing in the barrels after making. The dies were then made over so that the metal was stretched in the press operation and no season-cracking of the shells followed.

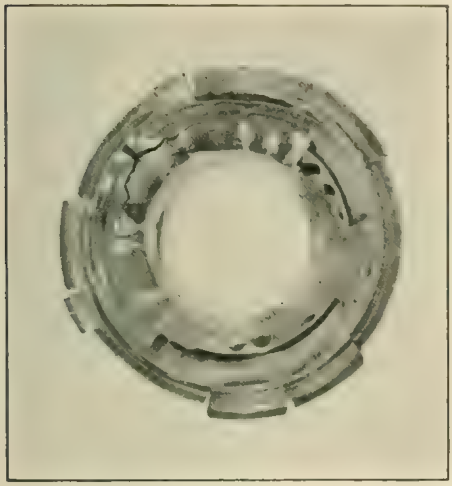

**Fig. 6. Top of Lamp Shown in Fig. 2.**

## Some Properties of Electrolytic Iron.

In *Comptes rend.* 702-705, 1913, L. Guillet and A. Portevin describe their experiments on electrodeposited iron. The iron they obtained was practically free from carbon. The crude metal, when taken from the electrolytic bath was found supersaturated with hydrogen and was extremely brittle. It showed a characteristic microstructure which, however, became normal after annealing in magnesia at 900° for 2 hours.

It was found by the determination of the electrical resistance that the electrodeposited iron, as it was first produced, contained 0.014% of hydrogen, while the annealed metal contained 0.008%.

## Some Remarkable Cobalt Alloys for Cutting Tools.

Augmenting his previous discoveries in the production of edge tools from the alloys of cobalt and chromium, Elwood Haynes of Kokomo, Ind. has greatly improved these alloys by the addition of tungsten, molybdenum or uranium. The use of tungsten in connection with chromium as hardening metals for cobalt is particularly useful.

Mr. Haynes previously found that if an alloy of cobalt and chromium is made, it is so hard that it will take a cutting edge and can be used in place of steel for the manufacture of cutlery. In addition to its hardness, the alloy is very non-corrosive. The proportion used for this purpose was as follows:

| | |
|---|---|
| Cobalt | 75% |
| Chromium | 25% |

This alloy has been called ""Stellite" by Mr Haynes and as such has been placed on the market in the form of table cutlery and pocket knives.

Since the foregoing alloy was discovered, experiments have been carried out by Mr. Haynes with the endeavor to improve the quality of the metal and he has been rewarded with excellent results. Tungsten, molybdenum or uranium, it is well known, when alloyed with iron, form very hard steels. The same seems to be true in the case of cobalt. Tungsten is the metal that is more particularly used in conjunction with chromium for hardening cobalt. This metal, as well known, is the material used in the so-called self-hardening or high-speed steels.

The following alloys have been found to have remarkable properties:

An alloy composed of:

| | |
|---|---|
| Cobalt | 70% |
| Chromium | 25% |
| Tungsten | 5% |

is particularly suited for the manufacture of table cutlery, pocket knives and wood tools. It forges readily at a red heat so that it may be wrought into the necessary shapes. The alloy takes a fine cutting edge. If molybdenum is used in place of tungsten, an alloy of similar properties is produced. Moreover, the alloy (either with tungsten or molybdenum) takes a high polish, is white and very non-corrosive. As far as the non-corrosive properties are concerned, it is quite probable that they are next to gold and platinum and certainly surpass any of the common metals and alloys now known.

An alloy composed of:

| | |
|---|---|
| Cobalt .................... | 60% |
| Chromium .................. | 15% |
| Tungsten .................. | 25% |

is so hard that it can be used for lathe tools for cutting steel and cast iron. It has been found that such tools are superior to the best grades of high-speed steel for this purpose. An alloy consisting of the following:

| | |
|---|---|
| Cobalt .................... | 55% |
| Chromium .................. | 15% |
| Tungsten .................. | 25% |
| Molybdenum ................ | 5% |

when cast into a tool will cut steel or cast iron, without injury to the tool, from 50% to 100% faster than a tool made from the best "high-speed" steel known to the trade.

When the percentage of molybdenum in the alloy is 40%, the utmost hardness is obtained. It is stated by Mr. Haynes that such an alloy will not only cut glass readily, but will scratch quartz. This remarkable property has never yet been obtained in a metal or alloy. Hard steels will scratch glass but will not scratch quartz.

As with the simple alloy of cobalt and chromium, Mr. Haynes has been granted patents upon the ternary and quartenary alloys previously mentioned.

## Gum-Guaiac Varnish for Stopping-Off Nickel Deposits.

It is frequently necessary to use a stopping off material in nickel plating, although in the majority of instances it is quite undesirable as nickel is so cheap that the labor involved in stopping off is greater than the actual saving of metal. The case is different, of course, in silver plating where it is desired to save the silver on acount of its cost.

An instance where it is often desirable to stop-off a nickel deposit is in the use of black nickel deposits for producing the French-gray finish on silver. Now and then other cases are encountered in depositing white nickel, where a stopping off varnish is desirable.

As a stopping-off varnish for nickel solutions (or acid copper, if desired) one made from gum-guaiacum is very serviceable and is used in the trade. It can easily be made by anyone.

Gum-guaiacum is frequently called "gum-guaiac" and is a resinous material of vegetable origin. It is quite brittle and somewhat resembles ordinary rosin, although a trifle darker. It is employed in medicine. It is soluble in wood alcohol.

To make the varnish, dissolve the gum in wood alcohol. Place it in the bottom of a bottle or glass jar and cover with wood alcohol. Shake from time to time until it is dissolved. The consistency of the varnish depends upon the amount of gum used. This point, however, may readily be determined by the one who makes it and if too thick, more alcohol can be added to thin it. It should not be too thick, however, as it must be filtered and when in this condition it does not filter readily. It should be about as concentrated as ordinary shellac varnish.

When the gum has dissolved in the alcohol, it is necessary to filter it for the reason that it contains sticks, dirt and a miscellaneous assortment of foreign matter which would, if allowed to remain, interfere with the use of the varnish for stopping off. Filter through absorbent cotton in the bottom of a glass funnel or regular filter paper. Fine cloth may be likewise used.

The varnish thus prepared is ready for use with the exception that it is preferable to color it so that it may readily be seen on the article upon which it is used. The color does not make much difference and either pink or blue can be used. The coloring material is analine dye. This should be the kind that will dissolve in alcohol and in the trade it is known as "analine blue, alcohol soluble", in case the blue is to be used.

The varnish is painted upon the parts that are to be stopped off and allowed to dry which takes but a few minutes. To remove it after plating wood alcohol can be used, but the varnish has the great advantage of being quite soluble in caustic potash or caustic soda. It is usually customary, in plating establishments using the varnish to remove it in a hot potash or soda solution.

As the gum is soluble in alkalines, the varnish cannot be used for stopping-off work plated in cyanide solutions. It is suitable only for nickel, acid copper or other non-alkaline plating solutions.

# The Estimation of the Free Cyanide in Brass Plating Solutions.*

Brass plating solutions are the ones that usually cause platers the most trouble. The fact that two metals have to be deposited simultaneously in order to obtain the right color, renders the electro-deposition of brass so difficult. A brass plater who can maintain his solution so that the same color can constantly be obtained on the deposit, day in and day out, has had experience and the very fact that he can run the solution indicates it. Novices always experience trouble. They may obtain a good deposit for a short time but as soon as it begins to bother them, they are perplexed and have difficulty in getting out of the trouble. The reason for all of these annoyances is the fact that brass solutions are always run by "rule of thumb" and there has been no way, except that of experience to indicate when the solution is right or when it is wrong.

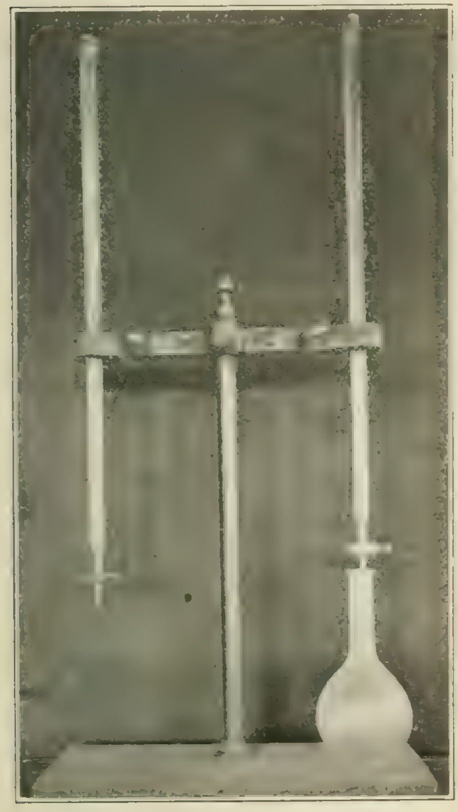

Fig. 1. Burettes and Stand.

The whole question of conducting a brass plating solution seems to hinge upon maintaining the free cyanide in practically a constant condition and using a uniform current density. The copper and zinc proportions are readily determined by the color of the deposit. If too red, then more zinc is necessary in the solution, and if too pale, then more copper must be added. The current density is readily adjusted by means of a suitable rheostat and electrical measuring instruments. When it comes to the free cyanide, however, no method has been known for determining it, and, for this reason, this most important item in a brass solution has been left without any means for estimation and the only way to determine it has been by means of the manner in which the anodes coat over and the density of the solution, etc. Matters which have been quite unsatisfactory.

Fig. 2. The Liter Flask.

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*This method was worked out in the experimental laboratory of The Brass World.

Free cyanide in silver plating solutions can of course be determined by means of a solution of silver nitrate, but if this method is used for estimating the free cyanide in a brass solution it will be found that there is quite an obstacle in the way. The determination, in the case of silver, consists of adding a standard solution of silver nitrate to the plating solution until the precipitate formed does not dissolve, but remains as a slight turbidity in the solution. If the same procedure is followed in the case of the brass solution, it will be found that the zinc begins to be precipitated out from the solution long before the final point can be obtained. A white, cloudy solution is thus produced which effectually masks the final reaction with the silver nitrate. This obstacle prevents the use of silver nitrate for the determination of the free cyanide in a brass plating solution.

It has been found, however, that if a solution of zinc nitrate is used instead of the silver nitrate, the zinc is not precipitated out, as previously mentioned, and there is no turbidity formed until the free cyanide has all been neutralized. The end reaction, therefore, can be obtained satisfactorily and accurately. The method of making up the solution of zinc nitrate and using it will subsequently be explained.

### *The Apparatus Necessary*

A few pieces of chemical apparatus are necessary for determining the free cyanide and they are as follows:

1. One or two glass burettes. These are long glass tubes, as shown in Fig. 1, graduated in cubic centimeters and fractions of them. They should be provided with a glass stopcock at the bottom. The burettes should hold 50 c. c. (cubic centimeters) as this is the best size. While it is possible to get along with one burette, two will be found better as it will save washing out each time it is used.

2. A burette stand. This is also shown in Fig. 1 and is used to hold the glass burettes. The burettes are held by wood clamps.

3. A liter flask, with the neck marked for 1 liter, and provided with a glass stopper. This is shown in Fig. 2.

4. A small glass flask, shown in Fig. 3. This holds about 200 c. c. and is not stoppered. It is known as the regular glass flask used by chemists.

5. A glass funnel about four inches in diameter.

6. Some filter paper.

7. A glass bottle for holding the standard solution. This should be of large size and hold about two quarts or more. It should be stoppered, preferably with a glass stopper, although a cork may be used if desired.

### *Uses of the Apparatus*

The burette is used for measuring the standard solution used for determining the free cyanide in the brass solution and this constitutes the principal piece of apparatus used. The litre flask is employed for making up the standard solution of zinc for determining the free cyanide and the mark on the neck of the flask is necessary so that exactly one litre can be measured. The small glass flask is used for holding the brass plating solution while the free cyanide is being determined. The brass solution is run into it from one burette and the standard zinc solution is then run in from the other, the flask constantly shaken and the addition of the standard zinc solution continued until the precipitate which forms, as the two solutions come in contact with one another, will not redissolve on shaking, but remains as a turbidity or precipitate in the liquid.

The glass funnel is used to filter the brass solution before using, by means of the filter paper, and is usually necessary on account of the fact that the brass plating solution is not apt to be quite clear. Any sediment or dirt in it is apt to interfere with the final reaction. It is advisable, therefore, to filter it so as to have a perfectly clear solution to work with. If, however, it is clear at the start, filtering will be unnecessary.

The bottle is used to hold the standard zinc solution and should be kept tightly stoppered or corked to prevent evaporation. When this is done it will keep indefinitely.

### *The Zinc Nitrate Solution*

The zinc nitrate solution is made in the following manner: *Weigh out exactly* 11 *grams metallic zinc.* Sheet zinc will do. This weight must be exact as it is the essential portion of the whole operation. If no means are had for weighing it, then it will be necessary to have it done. Any chemist can do it as the metric system is always used in chemical work.

Place the 11 grams of metallic zinc just weighed out, in the liter flask. Cover it with clean water, and then add a little nitric acid. The zinc will begin to dissolve. Do not add too much acid or the action will be too violent.

When the action ceases, add a little more nitric acid. This is continued until the zinc is dissolved. Avoid using any more acid than is necessary to dissolve the zinc.

When the zinc has dissolved add a little more water to it, if necessary, so that it will not be too concentrated, and then a solution of sal-soda is added to it and the whole shaken. The object of adding the sal-soda is to neutralize the last traces of free acid in the zinc nitrate solution, after the zinc has all dissolved. The sal-soda solution is added a few drops at a time and the whole shaken. The precipitate at first produced, is redissolved when the solution is shaken. Then it dissolves very slowly. The point at which the precipitate just barely dissolves is the one at which the addition of the sal-soda solution should be stopped. If, however, it should be carried too far so that a permanent precipitate is produced, a drop or two of the nitric acid will bring it back, but great care must be exercised not to add too much nitric acid so as to bring back the acidity again. The object is to obtain a *neutral* solution of zinc nitrate, containing, of course, no free acid or no free alkali or precipitate. If the solution is turbid, it shows that too much sal-soda has been added. *When right, it should be perfectly clear.*

Now add clean water to the flask until the solution reaches the liter mark at the neck. Care must be taken in doing this or too much will be added. At the top of the solution, in the neck of the flask, it will be found that the liquid curves. Use the bottom of the curve or meniscus for reading. In other words, the bottom of the curve or meniscus should be exactly level with the liter mark on the neck of the flask. This will, therefore, give 12 grams of zinc in 1 litre (or 1000 c. c.) of solution. *It must now be mixed.* This is done by placing the glass stopper or cork in the neck of the flask and shaking, allowing the liquid to run into the neck of the flask while it is being done. Care should be taken to mix well. Now pour into the bottle in which it is to be kept and always keep well corked. It will then remain in uniform condition indefinitely.

### *Determining the Free Cyanide*

The glass burettes are rinsed out with water and then fastened in the burette stand. A little grease is placed on the glass stopcocks to make them turn readily. The burettes are now turned upside down and allowed to stand for a while to allow the water to drain out. When this is done, turn over for filling with the solutions.

Fill one of the burettes with the brass plating solution, in which the free cyanide is to be determined. This solution should be filtered, if not perfectly clear as it is impossible to estimate the free cyanide accurately in a turbid solution. In filling the burette, let the solution run above the zero mark, then allow it to run down by opening the glass stopcock.

Fill the other burette with the zinc nitrate solution and allow the solution to run down to the zero mark. The bottom of the curve of the liquid in the burette should be exactly level with the zero mark and always use it. In other words, always gauge the liquid, both before and after the determination has been made bv the bottom of the curve as this method will give uniformity.

Fig. 3. The Small Flask.

*Allow 37.8 cubic centimeters (c. c.) of the brass plating solution to run into the small flask.* The reason for taking this quantity is that it is exactly a hundredth of a gallon and avoids any calculation in obtaining the amount of free cyanide in ounces per gallon.

When the 37.8 c. c. of the brass solution has been run into the flask, place it under the second burette and allow the zinc nitrate to run in drop by drop. Shake the flask after each addition. As the zinc nitrate solution strikes the brass solution, a white precipitate will be produced, but this will dissolve when the flask is shaken. Continue the addition of the zinc nitrate solution until the white precipitate dissolves rather slowly. Then continue the addition very cautiously as the end point is near.

As the end point approaches, carefully add the zinc nitrate solution, drop by drop and shake until the *decided* precipitate that forms *does not dissolve*. This is the end, and the amount of the solution in the burette should now be read off. Be careful to obtain a decided precipitate in the liquid which will not dissolve on shaking and standing a few minutes. This point indicates that all the free cyanide in the brass solution has been neutralized by the zinc nitrate solution. The point is reached when a *slight* but *decided* turbidity is produced which does not redissolve on shaking the flask containing the solution.

### *Reading the Burette and Calculating*

Read off the level of the zinc nitrate solution in the burette. This, of course, will give the number of cubic centimeters of the zinc nitrate solution used to neutralize the free cyanide in the brass solution. Now divide the number of cubic centimeters (c. c.) used by 10 and the amount of free cyanide in ounces (Avoirdupois) in a gallon of the brass plating solution.

*Example*: Suppose the amount of zinc nitrate solution used was 46.7 cubic centimeters (c. c). Then dividing this by 10 gives 4.67 which means that the brass plating solution contains 4.67 ounces of free cyanide in a gallon.

*Note*: The free cyanide, of course, is assumed to be potassium cyanide of 98-99 per cent equivalent, as this is the usual method of considering it. The weights are taken upon this supposition and it is the method always employed for estimating the free cyanide, either by silver nitrate or other methods.

### *Summary*

The various stages in the estimation of the free cyanide in a brass solution are as follows:

1. Running in exactly 37.8 c. c. of the brass plating solution to be tested.

2. Adding the zinc nitrate solution from the second burette until the precipitate which forms upon the addition, does not redissolve on shaking.

3. Reading off the burette containing the zinc nitrate solution and dividing by 10. The result gives the number of ounces (Avoirdupois) of free potassium cyanide in a gallon of the brass plating solution.

The method is adjusted so that amounts up to 5 ounces of free cyanide per gallon can be determined by the zinc nitrate solution without refilling (as the burette holds 50 c. c.), but if it contains more, then the burette will have to be filled twice. This means only a little extra labor and the results are the same.

### *Examples*

The amount of the brass plating solution used is always the same as it is a hundredth of a gallon. If desired, a piece of paper can be pasted at the 37.8 c. c. mark on this burette to guide the operator. The following examples will serve to indicate the method of calculation:

1. Number of cubic centimeters used was 10. Dividing this by 10 gives 1 oz. of free cyanide per gallon.

2. Used 89.8 cubic centimeters of the zinc nitrate solution. The free cyanide, therefore, would be 8.98 oz. per gallon.

3. Amount of zinc nitrate solution used was 40 cubic centimeters. This shows that the solution contains exactly 4 oz. of free cyanide per gallon.

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## A New Metal in Platinum Minerals.

In the analysis of the platinum minerals from the Ural mountains in Russia, H. C. Holtz in *Ann. Chim. Phys.*, observed anomalies which possibly indicate a new metal.

The oxide of this metal is insoluble in mineral acids including aqua-regia, but dissolves in sodium hydroxide to a yellow solution, which remains yellow on acidifying with hydrochloric acid. The acid solution thus obtained gives neither a precipitation nor coloration with potassium iodide, but is decolorized by stannous chloride. The oxide is not affected by fusion with sodium carbonate and potassium nitrate. The metal, however, is dissolved in fused potassium bisulphate, but when the reddish brown melt is dissolved in water, no white basic sulphate separates as in the case of rhodium. The metal is soluble in nitric and hydrochloric acids, but its solution in hydrochloric acid solution is not precipitated by ammonium chloride.

## Some Notes on the Electric Vacuum Furnace.

One of the most interesting furnace processes that has lately made its appearance is the "vacuum furnace". While it really embodies nothing new in theory and likewise in practice, in the past it was never used commercially, and, indeed was employed only for experimental purposes in the laboratory and to illustrate certain physical facts. It is only within the past few years that this form of furnace has been used commercially and it was the advent of the tungsten and tantalum electric lamps that rendered its use necessary. With the appearance of these useful appliances the vacuum furnace simultaneously appeared on a large scale. Without it, the tungsten lamp probably never would have made its appearance.

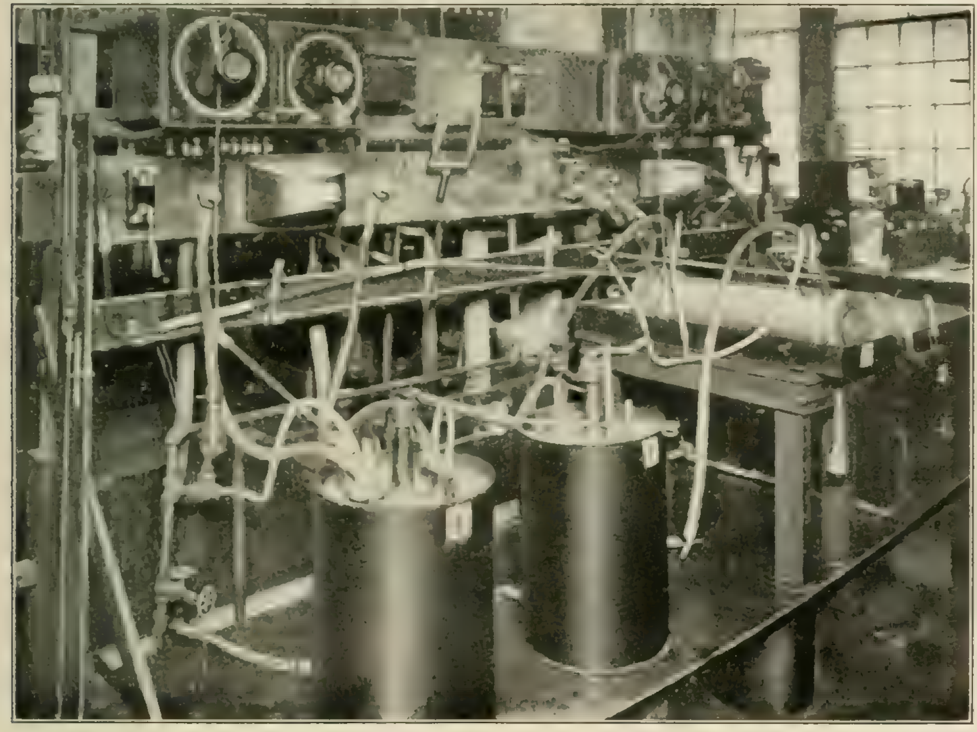

Fig. 1. Small Vertical and Horizontal Vacuum Furnaces.

The vacuum furnace is one in which a material may be heated or melted in a vacuum. While any method of heating may be used and the form of heat does not affect the furnace in name, it has been found impossible, on a commercial basis, to employ any means except the electric current. While outside heating may be used on a small scale and for comparatively low temperatures, it does not suffice for high temperatures or treating considerable amounts. As the electric current is used for heating the furnace, it is natural that the appliance should be called the "electric vacuum furnace".

The vacuum furnace has been perfected in the United States by the General Electric Co. of Schenectady, N. Y. makers of tungsten lamps and which was first used in making ductile tungsten. It was found that the metals like tungsten, which could be used for lamp filaments, when melted or heated in the air, absorbed nitrogen and oxygen and became hard and brittle. In the case of tungsten, for example, the metal is first obtained in the form of a powder by reducing the oxide with hydrogen. The metal, however, absorbs hydrogen and such absorption prevents the tungsten from having the necessary ductility. In order to expel the hydrogen, heating the tungsten in a vacuum furnace is carried out. All metals seem to absorb gases during melting, which impart to them undesirable properties and frequently influence and lower the ductility to a great extent. When melted in a vacuum furnace, however, the gases are expelled and pure metals are obtained (provided, of course, that no impurities of a metallic nature are present in the metals) which have the maximum ductility.

The electric vacuum furnaces herewith shown are a part of the equipment of the Research Laboratory of the General Electric Co. at Schenectady, N. Y. and are the invention of W. C. Arsem of this company. Strictly speaking, the furnace consists of a heater, almost completely surrounding the object to be heated or melted, and this, in turn is enclosed in the vacuum chamber. Various forms of furnaces are employed, depending upon the character of the object to be heated. In Fig. 4 is shown a horizontal furnace in cross-section and which may also be seen in Fig. 1.

The electric vacuum furnace is heated by a resistance element composed of graphite as this material has been found most suitable for the purpose. It offers the necessary resistance to the passage of the current so that heating results, and, at the same time, is infusible. The vacuum chamber is made of gun-metal (bronze) and tinned on the inside so as to fill up the pores and imperfections of the casting and render it air tight. All joints are made air tight by means of lead gaskets.

A radiation screen is a device used for minimizing the amount of heat lost by direct radiation from the heater and thus increasing the efficiency.

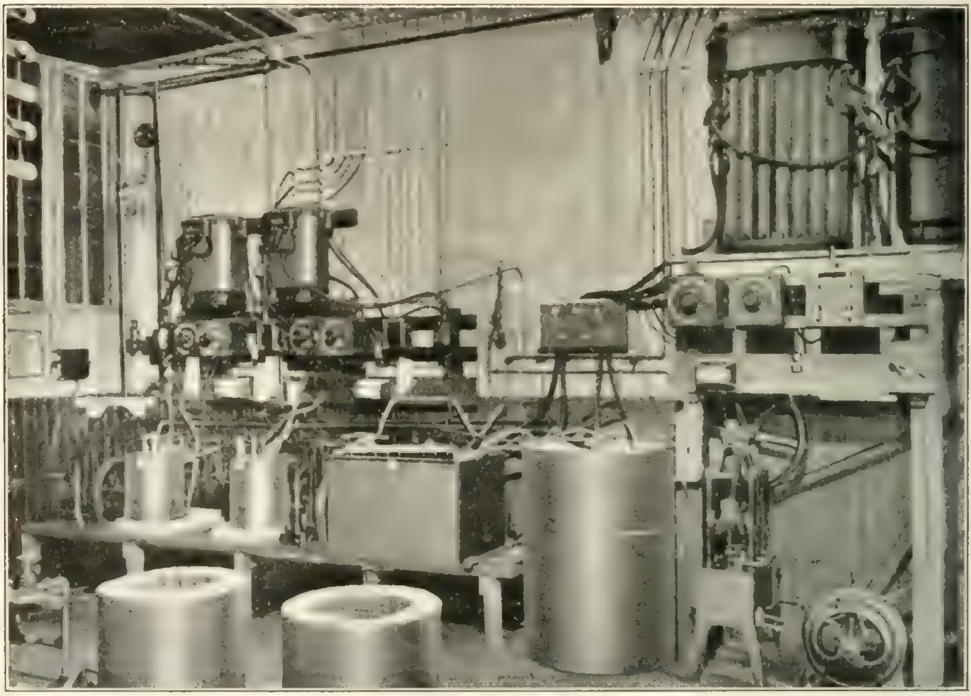

Fig. 2. Large Vertical Vacuum Furnace.

In Fig. 1 are shown two small vertical electric vacuum furnaces. This type of furnace is used for small laboratory experiments and a crucible can be used, if it is not over 4 inches high and 1½ inches in diameter. The highest temperature that can be obtained with it is practically 3100° C., but for ordinary uses it is unnecessary to employ a temperature higher than 2500° C. This can be obtained with 10 kw. current consumption. Some of the uses of this vertical furnace for laboratory purposes are: Preparation of alloys and metals, carbides, silicides, etc. Determining the melting points of metals, alloys, glazes, enamels, slags, fluxes, etc. Calibration of pyrometers. Distillation of substances for separation or purification.

The Research Laboratory of the General Electric Co. contains some large vertical vacuum furnaces and one of which is shown in Fig. 2. This will take a crucible 4 in. in diameter and 10 inches high which is, it will be readily appreciated, quite large for such a type of furnace. This crucible can be heated to 2500° C. or higher. This is the largest vacuum furnace yet constructed for laboratory use. It is used for the same purpose as the smaller type, except that larger quantities of substances may be treated.

In Fig. 3 is shown the "box type" of electric vacuum furnace and which is used for special shapes. It will take a box-shaped crucible, 4 inches wide, 8 inches high, and 12 inches long.

The furnaces are provided with a peep-hole or window of mica so that the progress of the operation may be watched. This feature is of value from the standpoint of investigations as it enables the operator constantly to see what is taking place. The furnaces are also water-jacketed for preventing the portions of the furnace liable to be affected by the heat from reaching too high a temperature.

The durability of the furnace seems to be remarkable and the General Electric Co. make the following remarks about it: Since the furnaces are evacuated, there is, of course, no wasting of the heater and other graphite parts by oxidation. Volatilization and disintegration of the graphite begins at about 2500° C. so that at this temperature, a heater will waste away at its middle point in about 9 hours, while at 3100° C. it will last less than one hour. Up to 2000° C., however, graphite does not volatilize appreciably, so that the heater which is never run above this temperature ought to last indefinitely. The heaters are expensive and the replacement is a simple matter. Over 500 runs have been made in one of the small vertical furnaces.

The air is pumped from the furnaces by special pumps employed for the purpose. At the works of the aforesaid company, two double- cylinder Geryck pumps and a three-cylinder Packard pump are used for the evacuation.

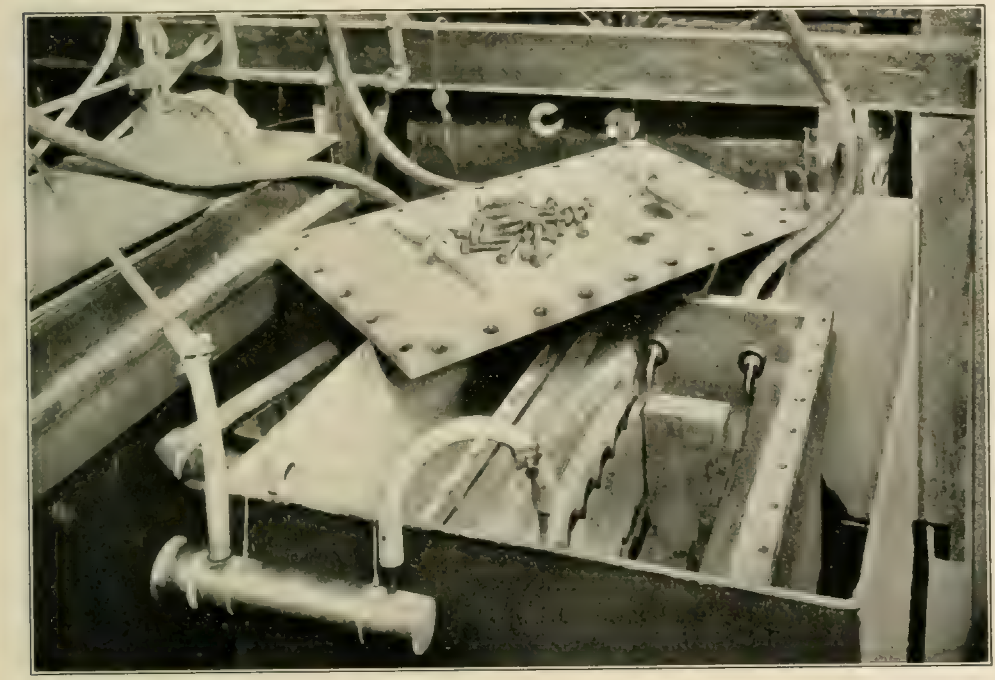

Fig. 3. Showing Inside of Box-Shaped Vacuum Furnace.

The interest now manifested in the high melting metals and alloys which have been found to have such valuable properties when treated in the vacuum furnace, renders this method of melting metals of particular concern at the present time. It is probable that many new properties of the high melting metals will be discovered by its use and many new lines of work in which they can be employed will be opened up. Metals and alloys which, when melted or treated in ordinary way, show no useful properties, may develop remarkable ones when melted or treated in the vacuum furnace. It will result, as it already has done, in opening new fields.

Many scientific institutions have already installed the furnaces and among them the Bureau of Standards at Washington, D .C., Cornell University, the Massachusetts Institute of Technology, New Hampshire College and the Rennselaer Polytechnic Institute. Instead of treating minute quantities of materials, like some of the early forms of electric furnaces, a sufficient amount can be treated at one time to allow the furnace to be actually used for manufacturing operations. In the large size furnace, previously mentioned, several pounds of metal may be melted or reduced from their oxides at a time.

For all aluminum alloys, both those in which aluminum is the chief constituent (the light aluminum alloys) or the aluminum bronzes, molding sand must be worked as dry as possible. The disadvantage of sand too wet is that it causes the metal to boil when it strikes the mold and then produces dross. The dryer the sand the less the dross. Many a casting, particularly those of aluminum bronze, has been spoiled by using the sand too wet. It is unnecessary to skin dry the mold but the sand should be as dry as it can be worked and not rammed too hard.

## The Failure of Graphite Galvanizing Kettles.

It is the custom in galvanizing iron or steel by the dipping or hot method, to use iron kettles for melting the zinc. The zinc, however, alloys with some of the iron of the kettle, after it has been melted and used for some time and forms a zinc and iron alloy called "zinc dross". This dross (which is a misnomer, by the way as it is not actually a dross but an alloy) is not fusible at the galvanizing temperature and separates out as a thick, pasty mass. This dross constantly forms as the galvanizing goes on and constitutes a considerable waste in the process.

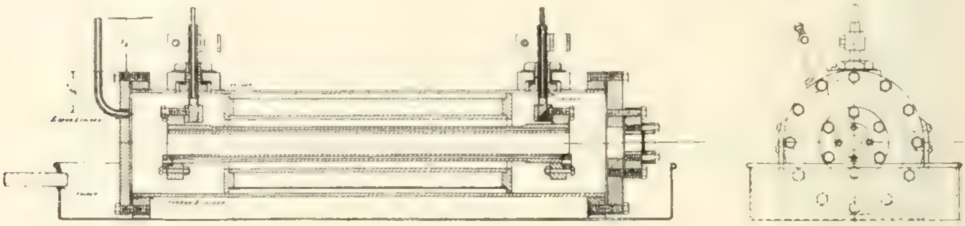

Fig. 4. Cross-Section of Horizontal Furnace in Fig. 1.

In order to obviate this loss through the formation of zinc dross, a patent was granted a number of years ago upon a graphite galvanizing kettle and which patent is owned by the American Steel & Wire Co. The kettle has been in use for some time at their works in Worcester, Mass. The method of using it was unique. It was found that if the kettle was directly heated by the fire, the graphite burned out from the surface and caused it to scale. In this connection it may be said that the graphite mixture used was that employed in the manufacture of graphite crucibles. The scaling gradually wore away the kettle and finally rendered it useless. As the kettle was large, its cost was great and the loss became a matter of importance.

To offset this burning away of the graphite, the kettle was immersed in a bath of molten lead contained in an outer iron kettle. This lead not only protected the graphite from the air, but produced an even heating.

It was thought at the time that this use of the molten lead jacket for the graphite kettle would obviate the difficulty experienced in the employment of the bare graphite and so it did to a certain extent. It now appears, however, that the use of the kettle has been abandoned as it was found so expensive in the way of breakages and deterioration that the saving was not sufficient to warrant its continued employment. In the prevention of dross formation, however, it was quite satisfactory.

It would appear, therefore, that the use of iron or steel galvanizing kettles will be continued for some time, although the amount of dross produced in galvanizing is such that the field in the prevention or reduction of this material is one which is worthy of serious attention.

## Plugging Blowholes in Brass and Iron Castings.

In the April issue of The Brass World, the Buckeye Mfg. Co. of Canton, Ohio communicated a method of plugging blowholes in castings. Since then they have given us additional information about this method.

It is frequently desirable to plug blowholes in castings when they are to be plated, japanned or lacquered. The blowhole or blowholes may not injure the castings in any way and the only detriment is the appearance. It is, therefore not only desirable but necessary to plug the blowholes. In this connection the aforesaid concern gives us the additional information as follows:

"If the blowhole is half an inch in diameter, a quarter of an inch hole can be drilled into the casting and a piece of quarter inch copper wire driven into it. The end should be left long enough so that, when riveted down, it will fit the cavity. It is unnecessary to drill a hole that will cut out the entire blowhole. This method of plugging blowholes, of course is practically only on castings of sufficient size or weight to render it worth while or in other words will pay. It does not take long, however, to drill a hole and drive in the copper plug and file it off even with the casting. After this has been done it can be nickel plated and the fact that there is a blowhole in the casting will never be known."

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Electrogalvanizing is now extensively used in a large variety of trades. For many purposes it has proved superior to hot galvanizing and in others has replaced nickel or copper plating. It has now become a well established fact that a zinc coating upon iron or steel is the best rust preventitive known.

## Use of Strong Solutions for Electrogalvanizing.

The zinc salt employed almost exclusively for electrogalvanizing is the sulphate. This is the cheapest of any salt that can be used for the purpose. The only other modification employed for the electrodeposition of zinc is a cyanide solution which is now and then used, although rarely, in instances where the sulphate cannot be employed.

Zinc sulphate occurs in commerce in the form of fine, white needle-shaped crystals. These crystals contain 43.90% of water in the form of "water of crystallization". Upon standing in the air, the water is gradually given off and dry sulphate of zinc remains. The dry sulphate of zinc, therefore, contains a far greater amount of zinc than the crystallized salt for the reason that its water is being lost, which, of course, increases the zinc percentage. The amount of zinc in the crystallized and dry salts is as follows:

| | |
|---|---|
| Crystallized Zinc Sulphate .. | 22.64% Zinc |
| Dry Zinc Sulphate .......... | 40.37% Zinc |

It has been found that the best results are obtained if a solution of zinc sulphate used for electrogalvanizing is pretty concentrated. It then "throws" better and the zinc deposits more rapidly with a given voltage on account of the increased conductivity.

It will be appreciated, therefore, that if a formula is given for making up an electrogalvanizing solution with zinc sulphate, and the crystallized salt is used, then it will not be the same if the dry salt is employed. It will then contain nearly twice as much zinc. In other words, uniform results cannot be obtained unless the same strength of solution is used, but this can be determined by the use of a hydrometer. It should be known that the crystallized salt, upon exposure to the air, gradually loses its water and becomes converted into the dry sulphate.

The old formula for electrogalvanizing which calls for 2 lbs. of zinc sulphate dissolved in 1 gallon of water is insufficient for some purposes and it is advisable to use a stronger bath. It will, of course, answer if the dry salt is used, but this is not obtained in commerce for the reason that manufacturers of zinc sulphate always desire to sell as much water as possible. It has been found that a solution containing 4 lbs. of the crystallized salt to a gallon of water is preferable. The use of sal ammoniac for increasing the conductivity and causing the anodes to dissolve more readily is advisable. Some aluminum sulphate for producing a smooth deposit should also be employed. The following proportions are recommended:

| | |
|---|---|
| Water | 1 gallon |
| Zinc Sulphate (crystals) | 4 lbs. |
| Sal-Ammoniac | 2 oz. |
| Aluminum Sulphate | 4 oz. |

This solution will stand between 30 and 40 degrees Beaumé. The sal ammoniac and the aluminum sulphate should be dissolved in a small quantity of water (preferably hot) and then added to the zinc sulphate solution. If added directly to it, they do not dissolve as readily on account of its concentration. This solution can be used with a low voltage, on account of its high conductivity. From 1 to 2 volts are suitable for the electrodeposition of the zinc from it. It is used cold.

If the zinc sulphate has become dry from standing in the air, then the solution can be made up by adding a less quantity and testing with the hydrometer.

The zinc deposit should be white and smooth and form rapidly. It will be found that the solution will "throw" into deep places much better than one that is weaker. Some platers have been known to use a saturated solution of zinc sulphate so that some of the salt remains undissolved in the bottom of the tank, but this condition is apt to coat the anodes over if there is a drop in temperature. With 4 lbs. of zinc to the gallon, the solution is very nearly saturated.

## Cause of Hard Silver Deposits.

Many jobbing platers who are called upon to do silver plating, are troubled with the silver deposit coming hard. When it is scratch-brushed, instead of smoothing down easily, it actually tears off particles of the brass from the brush and is given a brassy color. When buffed, it seems to defy the rouge on the buffing wheel and refuses to take a color. It is not infrequent to find that a plater will have recourse to tripoli for cutting it down so that it can be buffed. The silver deposit is so hard that it is difficult to buff it with the ordinary soft buff and rouge.

Such hard silver deposits are never satisfactory and they are not only "off color" but are apt to peel or flake off. A good deposit will respond readily to the scratch brush and matt down to a smooth, white surface. Under the buff it will take a color at once and require no particular effort to bring it up.

Hard silver deposits are nearly always caused by too strong a current. The silver is "burnt", and when this takes place it is always hard. If the deposit is coming hard, then it can be depended upon that the current is too strong. The volt-meter will give you an idea of what is going on, provided the solution is of the right strength, but if it has become concentrated by standing, then the voltmeter may not indicate the right value for the reason that the conductivity of the solution has been increased by the concentration and more current will pass through it at a given voltage. When the solution contains 3 oz. of silver and 3 oz. of free cyanide, then 1 volt is right, but if it has become concentrated beyond this point by evaporation, then 1 volt will be too much.

The trouble with a silver solution in a job plating establishment is that it evaporates through lack of attention. Again, too strong a current is generally used for the reason that other plating solutions, such as nickel or cyanide copper require it stronger and no means are possessed for reducing it. Under such conditions, the solution should be reduced with water. It will surprise platers to see how beneficial this will be. The solution is reduced or diluted by it, of course, and at the same time the conductivity is lowered so that at 1 volt very much less current passes.

Platers who have experienced trouble with hard silver deposits should dilute their silver plating solutions with water and the great improvement in the deposit will at once be apparent. Just how much water to add will naturally depend upon the degree of concentration, but this can be easily ascertained by a simple trial.

If a nickel plating solution gives a pitted nickel deposit, it can be overcome by the use of boracic acid in the solution.

In electrogalvanizing, a strong solution should be used, if it is necessary that the zinc deposit shall "throw". That is if there are deep places in which the zinc must deposit.

## A Cheap Soft-Solder.

Tin is now so expensive that any method of economizing in its use will be appreciated. It has been found possible, by the use of bismuth and cadmium to cheapen the ordinary soft solders so that considerable saving in cost will follow.

Bismuth and cadmium, of course, are expensive metals, and it would at first seem that by their addition the solder would be rendered more expensive rather than cheapened. The fact is, however, that by adding bismuth and cadmium to an alloy of lead and tin, the melting point is lowered. Therefore, it is possible to use more lead in the solder and still have it flow as readily and freely as ordinary soft solder.

It is a rule of alloys that the more ingredients they contain the lower the melting point and, for this reason, when both bismuth and cadmium are used, the melting point is lower than when only one of the metals is employed. By the use of both bismuth and cadmium, the melting point of the solder is lowered to such an extent that not only can considerably more lead be employed than is generally used in soft solders, but a small quantity only of the bismuth and cadmium are required. The following mixture has been found to give good results:

| | |
|---|---|
| Lead | 75 lbs. |
| Tin | 23 lbs. |
| Bismuth | 1 lb. |
| Cadmium | 1 lb. |

The metals can be melted together and fluxed with a small piece of rosin. This will remove what dross has formed during the melting and produce clean and easy flowing metal.

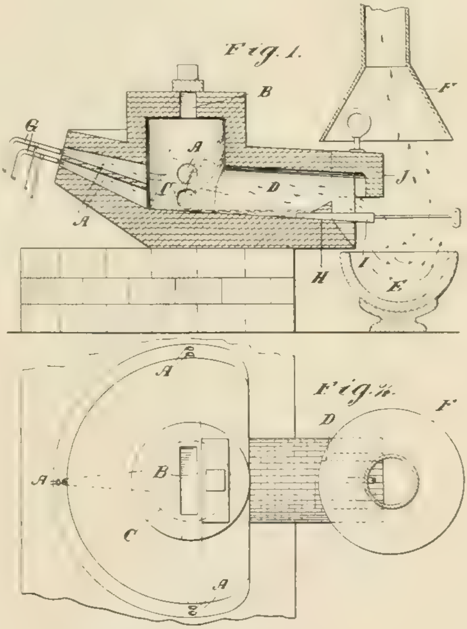
This solder is intended to replace ordinary half and half grade made of equal parts of tin and lead and has been used with good results for regular tinners work. It seems to flow readily and as far as can be noticed gives as good results in ordinary soldering as the regular half and half mixture. Whether it can be used for all classes of work has yet to be demonstrated, as there are probably some classes of work where it will not be found satisfactory, but for the majority of soldering of the commoner grade it appears to work well.

The saving in cost is nearly 10 cents a pound when compared with half and half solder, and 15 cents if the comparison is made with 2 and 1 solder.

## Purifying Electrolytic Copper.

A new process for purifying electrolytic copper or other varieties of this metal, has been patented by W. S. Rocky and Hilliary Eldridge of the Metallurgical Research Co. of New York City. The method is applied, the inventors say, to the purification of cathode copper produced by the electrolytic process.

The novelty lies in the use of reducing gas which is not only applied to the metal while melting, but while being poured. The gas has a reducing action and prevents the formation of oxide.



Method of Purifying the Copper.

The copper is melted in furnace at A and by means of a reducing flame of oil or gas. When melted, it flows out into the ladle or receptacle E. The reducing gases pass along at D and are constantly in contact with the molten copper. The construction of the furnace is such that the gases pass out with the copper and at no time is it exposed to the air.

## Strong, White Metal for Typewriter Parts.

[illegible] typewriter parts and which has been emp[illegible] castings to a large extent as it is non-cor[illegible] and is advantageous for the [illegible] that it will not corrode or rust like [illegible] and stiff for the pur[illegible] strated that it is an [illegible] purpose.

While the alloy is white, it tarnis[illegible] corrod[illegible] be noticed.

[illegible]

| | |
|---|---|
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| Aluminum .............. | 3 lbs. |
| [illegible] | [illegible] |

If, however, a smaller quantity than 100 lbs [illegible] be used:

| | |
|---|---|
| Copper ................. | 10 lb[illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| Aluminum .............. | 9 oz. |

[illegible] ner: First place the nickel in the bottom of the crucible with an equal weight of copper. Cover it with a thin layer of borax and over this a layer of charcoal. Force the heat until the nickel melts and then stir. The object of putting part of the copper in with the nickel is to cause the nickel to melt more readily. When the nickel has melted and with it the copper of course, stir well and then add the rest of the copper. If all the copper were added with the nickel, the melting would take longer and there would be more danger of "burning" it. When all the copper has melted, stir and then add the aluminum. When this has been stirred, the temperature of the cruci[illegible] hot. Such a phenomenon is [illegible] and the aluminum.

The crucible and its contents should [illegible] allowed to cool down before adding the zinc [illegible] If scrap of the same mixture is had, it can be used to cool the metal, but if not, then it will [illegible] for a while until its temperature has b[illegible] lower.

[illegible] add the zinc and stir well. Pour out [illegible] If the zinc is added before the aluminum, it [illegible] mum first in the [illegible]

[illegible] on account of the aluminum in it, it will run [illegible]

This alloy is very stiff and will not [illegible] lingly satisfactory. When cast, after it [illegible] from pin-holes and take a high polish. On account of the aluminum in it, dross is the worst obstacle found in casting it, but by keeping the pouring temperature down to the lowest possible limit, and using long gates, this can be prevented so that very bad castings will be [illegible]

The sand should be worked as dry as possible and the patterns should contain no sharp corners. If fillets are used and the gate is made comparatively large so that in shrinking the castings will draw from it, they will not draw or crack.

---

The largest consumption of tin is in the manufacture of tin plate. Tin cans for use as food containers now constitute the largest consumption of tin.

## The New "Abbott" Oscillating Burnishing Barrel.

The rapidly extending use of steel balls for burnishing metal goods by tumbling has been the cause of improvements on the barrels used for tumbling. It was early found that the forms of barrels that would answer for ordinary tumbling were not suitable for steel ball burnishing.

The Abbott Ball Co. of Hartford, Conn., the pioneers in the manufacture of steel balls exclusively for burnishing, originally brought out a barrel for use in tumbling with steel balls and which has given the utmost satisfaction. This barrel, however, was intended for small work as this was the class of material first treated by means of the steel balls. It was later found that comparatively large work could be tumbled with steel balls and this fact has created a demand for a barrel especially designed for this large work.

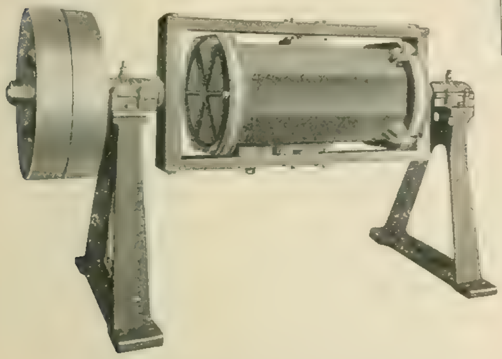


Fig. 1. General View of the Barrel.

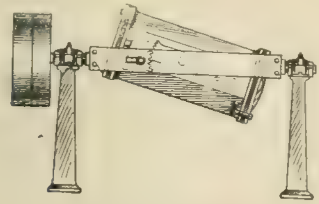


Fig. 2. Showing Locking Device.

Taking this fact into consideration the Abbott Ball Co. has recently designed and placed on the market a new form of tumbling barrel for use with steel balls. The barrel is herewith shown. It embodies a number of excellent features that will appeal to all who have occasion to burnish metal goods by means of steel balls. The inside dimensions of the barrel are: Diameter, 12 inches and length 30 inches. It is of octagon shape and lined with hard maple as this has been found to be the best for the purpose. Wood is better than metal as it does not scratch the work.

The barrel itself is held on trunnions inside of a yoke and it is also supplied with a novel locking mechanism. The barrel is made in the single or double type and both are operated in the same manner.

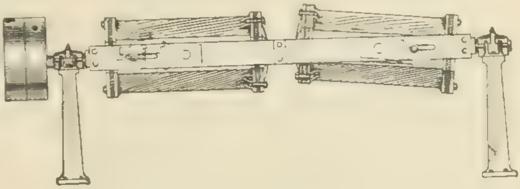


Fig. 3. A Double Barrel.

The oscillating feature of the barrel is one of the valuable improvements. The locking device prevents any movement except the actual angle or tilting desired, but the barrel may be given any desired angle of tilt by means of it. The object is to allow the barrel to be tilted to any angle that may be necessary. This fact causes the balls not only to roll over the work laterally, but longitudinally as well and thus produces the maximum effect. As some kinds of work require less tilting of the barrel than others, it will readily be appreciated that the tilting and locking mechanism cannot be surpassed.

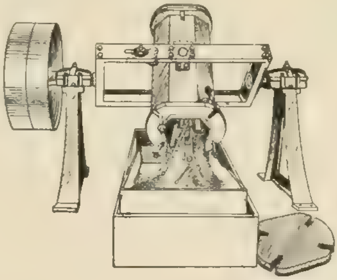


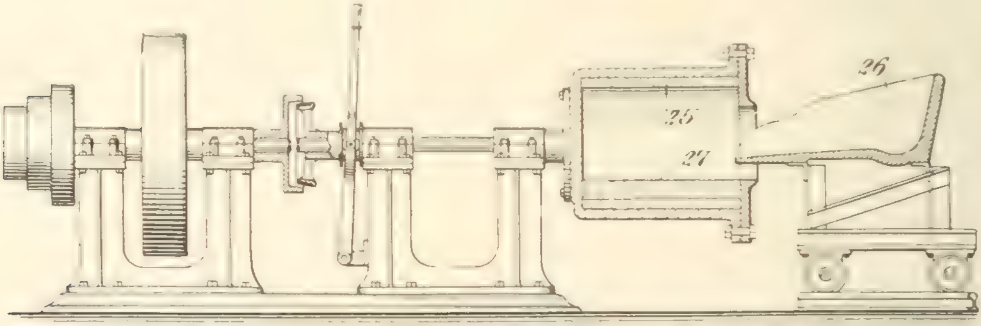
Fig. 4. Method of Emptying the Barrel.

An additonal feature of the barrel is the method of emptying it. The locking device is disengaged and the barrel turned on its trunnions so that the entire contents of the barrel, balls and work, can be emptied into a receptacle.

In the use of the barrel, it is desirable to fill it almost completely full of work. This feature is unlike other barrels which have been filled only about one-half or two-thirds full. This very fact allows the barrel to be used on work that could not be treated in the regular barrell. Small work is more advantageously tumbled in the regular Abbott barrel and the object of designing this barrel was to adapt it for large work. The barrel is manufactured for the trade by the Abbott Ball Co., of Hartford, Conn.

## Casting Tube-Shells by "Spinning."

The casting of tube-shells, pipes ond other cylindrical bodies by "spinning" embodies nothing new and many patents have been taken out on the process. The principle of the method is to cast molten metal in a hollow cylinder while it is being rapidly rotated. The amount of metal poured into the cylinder determines the thickness of the cast shell or tube.



Method of Casting Tubes and Pipes by Spinning.

A modification of this "spinning" process has recently been patented by William H. Millspaugh of Sandusky, Ohio, the apparatus for which is herewith illustrated.

The mold is shown by 25 and is rotated by a shaft driven by a belt. A clutch, operated by a lever is placed between the driving pulley and the mold to enable the rotation to be instantaneously started when the metal is being poured. The metal is designated by 27 and is poured from the ladle or hopper 26. The mold may be lined or unlined as the case may require. In some instances a row of gas jets is placed under the mold to heat it previous to the casting of the metal

## Removing the Enamel from Useless Enamel Cooking Utensils.

In the manufacture of enameled cooking utensils, a considerable proportion produced are unsalable on account of imperfect enameling. Such imperfections consist of ware not wholly covered by the enamel, spots, roughness and other abnormal conditions which prevent the sale of the goods. Such imperfect ware has been thrown away and its disposition, particularly in some communities, is a troublesome matter.

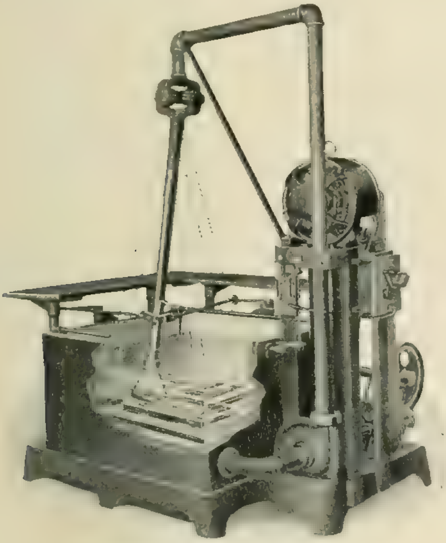
A process has been patented by Gustave Spitz of Brünn, Austria-Hungary and assigned to the Goldschmidt Detinning Co. of New York City, which renders it possible to remove the enamel and again utilize the steel article for re-enameling.

The method used consists in using a solution of caustic soda standing 15° Beaumé or thereabouts (caustic potash may also be used) and heated in a steel or iron drum or boiler. This drum is closed and heated until a pressure of from 7 to 15 atmospheres has been obtained. The enameled articles, from which the enamel is to be removed, are placed in the solution and the whole heated, with the pressure mentioned. It is stated that the enamel is thus dissolved by the caustic soda and the steel utensil left clean for re-enameling.

The enamel dissolved by the caustic soda may be utilized by evaporation and the dry mass used again (taking into consideration the caustic soda present in calculating the mixture) or may be employed for a variety of purposes. One of these uses is the neutralizing of the waste acid from pickling the steel previous to enameling.

## An Improvement in Graphiting Electrotype Molds.

In making electrotypes, the type form is first pressed into wax so that it produces an exact duplicate of the type itself, but reversed. This mold is then coated with graphite, to render it a conductor of electricity, and then copper is deposited on it to the desired thickness, producing the "shell". The wax is next melted out and the shell filled with electrotype metal. After mounting upon a wood block, the electrotype is finished.



**The Machine for Applying the Graphite.**

The usual method of applying the graphite to the wax is by means of a soft brush and in the dry condition. This method is open to two objections: First, the dry graphite renders the operation dirty. Second, the brush, no matter how soft is apt to destroy some of the fine impressions in the wax.

A new method has recently been brought out by the Buffalo Electrotype Works of Buffalo, N. Y. for applying the graphite to the wax. The graphite is mixed with water so as to form a sort of emulsion and is forced, by means of a pump and pipe upon the face of the mold. In this way the graphite coats over the surface of the wax, rendering it a conductor of electricity and without the annoyance of the dust that follows when the dry process is used. The pipe is fastened to a universal joint and is constantly moved over the surface of the wax so that all parts are equally treated.

The advantage of the process which, by the way, is called the "A. R. Koehler Wet Graphiting Process" is that the fine lines and impressions are not broken down and it is, therefore, possible to make electrotypes of the finest half-tone blocks that will print equally as well as the original and will be free from fuzzy portions like those found on electros made in the regular manner.

## A New Process for Making Finely Divided Gold for Deposit Work.

In the use of gold or silver for making the paint used in deposit work (i. e. the paint used for decorating glass or other vitreous wares and which is afterwards "fired" on in a muffle) it is necessary to have them very finely divided. The finer the better as the paint must be ground and crystalline metal, when the crystals are more or less coarse, is very difficult to grind.

A patent has been granted to John W. Hasburg of Chicago, Ill. for a method of making finely divided gold for use in producing a gold paint for deposit work, or for china decoration. The process is described by him as follows:

"The usual process of precipitating metallic gold from its chloride with mercurous nitrate or ferrous sulphate produces a precipitation of very coarse grain, the product therefore covering a relatively small surface compared with paint made by my new process.

In carrying out my process I first prepare a solution of gold chloride—such solutions usually are acid in reaction to litmus paper turning blue litmus to red—I then add to this gold solution an excessive quantity of alkali, such for instance as potassium hydroxide. The effect of this, if carefully added, is to form a precipitate which, however, redissolves as this alkali becomes in excess, as indicated by the fact that a piece of red litmus paper placed in the solution is strongly turned to blue. To this solution mercurous nitrate is now added until no further precipitate forms. The precipitate is now separated from the liquid and preferably washed and then treated with an excess of acid, for example nitric acid, which dissolves any mercury compounds in the precipitate and it is then thoroughly washed.

By this treatment the gold is left in an exceedingly fine amorphous condition, which is mixed with a suitable flux such as the oxide, hydroxide, or subnitrate of bismuth or the borate or oxide of lead or other like metallic compounds and prepared for use as a paint by grinding with a resinous balsam in the usual manner.

I have here given a preferred method but ferrous sulphate may be employed instead of mercurous nitrate as a precipitant and some other alkali, such as sodium hydrate or the carbonate of the alkalies may be used. Also, in cases where ferrous sulphate is employed, sulphuric acid instead of nitric acid may be used.

## Effect of Remelting Gun-Metal.

The tin bronzes seem to be improved by remelting and the tensile-strength increased. The same is true of aluminum-bronze and it is impossible to make as good castings of the latter unless it is actually remelted (i. e. melted twice).

The following results on Government bronze (88% copper, 10% tin and 2% zinc) will indicate that this remelting is advantageous and also show how close the average brass foundry can be expected to work to a formula.

The tests were made of the so-called gun-metal (Government bronze) and which is supposed to consist of the preceding proportions of copper, tin and zinc. It is frequently known as "88-10-2" mixture. The metal was cast in one of the smaller Eastern foundries in order to ascertain what could be done in the way of adhering to the formula and in the physical characteristics. The effect of remelting was also tried and it will be noticed that the tensile strength and other physical characteristics are increased by this second melting. The variation from the formula intended is more than it should be and it is possible to work closer than this. The fact that small melts were made and scales not sufficiently accurate were used is responsible for the variation from the formula intended.

The results obtained were on a test bar of the following dimensions, and which was cast in green sand: Length, 13¼ inches; diameter, 1¼ inches. The bar was turned down in the middle for a length of 10 inches to practically 0.75 of an inch. The mixture made was:

| | |
|---|---|
| Lake Copper | 88 lbs. |
| Straits Tin | 10 lbs. |
| Prime Western Spelter | 2 lbs. |

The following were the results obtained on the test bars cast in green sand:

*First Melt*

| | |
|---|---|
| Diameter Test Bar | 0.798 in. |
| Broke at | 14,400 lbs. |
| Tensile Strength | 28,800 lbs. sq. in. |
| Elongation in 8 in. | 10.2% |
| Reduction of Area | 10.6% |

*Analysis of the Test Bar*

| | |
|---|---|
| Copper | 87.57% |
| Tin | 10.54% |
| Zinc | 1.82% |
| Lead | .04% |
| Iron | .03% |

The following tests were made of the mixture that was twice melted. After it was first melted, it was poured into ingots and these were then remelted and poured into the test bars. The melts were each different batches of metal.

*Melted Twice*

| | |
|---|---|
| Diameter Test Bar | 0.798 in. |
| Broke at | 17,400 lbs. |
| Tensile Strength | 34,800 lbs. sq. in. |
| Elongation in 8 in. | 15.5% |
| Reduction of Area | 14.2% |

*Analysis of Test Bar*

| | |
|---|---|
| Copper | 87.56% |
| Tin | 10.57% |
| Zinc | 1.86% |
| Lead | .04% |
| Iron | .03% |

The following test bar was also made of metal twice melted and the following results were obtained:

| | |
|---|---|
| Diameter Test Bar | 0.798 in. |
| Broke at | 19,500 lbs. |
| Tensile Strength | 39,000 lbs. sq. in. |
| Elongation in 8 in. | 17% |
| Reduction of Area | 20.4% |

The appearance of the fractures of the bars indicated the character of the metal as it always will on sand castings. The metal which had been melted only once, showed a rather coarse, crystalline structure which contained fine blowholes. The metal which had been melted twice showed no blowholes and the structure of the fracture was finer grain and less crystalline than the other (that which had been melted only once.)

The variation in the physical characteristics of the two test bars that had been melted twice, is undoubtedly explained by the difference in the pouring temperature. It is now a well established fact that two test bars poured from the same mixture at different temperatures will have different physical properties. It will be noticed that the variations in the analyses of the three test bars were very slight and they can, for testing purposes, be assumed identical.

## A New Solution for Electro-galvanizing.

A new solution for electrogalvanizing has been patented* by U. C. Tainton of Manchester, England and John N. Pring of Sandbach, England. The characteristics of the solution lie in the use of sulphuric acid which is added free, and of gum-tragacanth. The latter ingredient is introduced as a "toner" and which produces, the inventors say a smooth deposit.

The solution recommended by the inventors is as follows:

| | |
|---|---|
| Water | 1 gallon |
| Zinc Sulphate | 4 lbs. |
| Sulphuric Acid, 66° | 6 oz. (fluid) |
| Gum Tragacanth | 1 oz. |

The gum-tragacanth is first made into a paste with alcohol and then dissolved in a small quantity of water before adding to the solution. The use of the alcohol in this manner prevents the formation of lumps.

It is stated that a high current density may be used and 500 amperes per square foot is recommended, although it is said that good results may be obtained with much less.

The patentees state that the solution has the following advantages:

(*a*) The very high current density that is employed and the consequent saving of time and plant in depositing the metal.

(*b*) The deposits obtained are of a specially fine quality, smooth and lustrous. It is known that the metal comes down in a hard condition when high current densities are used but these high densities hitherto have been impossible owing to the small amount of acid mixed with the solution, usually about 1% or less, and its consequent high resistance. The drawback to the use of high densities however has been that the zinc comes down in non-adherent, powdery form, or in crystal form, the crystals growing between the anode and cathode and later short-circuiting the cell. The introduction of the addition agent or colloid or gum prevents this crystal formation and the metal comes down firm and lustrous.

(*c*) Commercial materials may be used in preparing solutions as it is found that most impurities have no effect in the presence of the addition agent or colloid and the large quantity of acid. For example, the presence of iron, which is a frequent impurity in zinc refining and which also has a bad effect on the electrolytic deposition of zinc, is immaterial in a solution prepared acording to this invention.

(*d*) The solution does not require so much attention as has hitherto been necessary and it is not necessary so frequently to regenerate it owing to the wide limits of concentration between which the deposition is successful. From 10-30% of acid may be present.

(*e*) The process is well adapted for plating on aluminum, which is in general a matter of extreme difficulty.

(*f*) In the case of zinc refining the electrolyte may be used without moving or rotating the cathodes or agitating the solution.

(*g*) Owing to the high concentration of the acid and the wide limits between which the concentrations may be varied it is specially easy to make up solutions, zinc and zinc oxide being very readily soluble in the solution.

The invention is found most useful for galvanizing wire electrically, a process which hitherto has been impossible owing to the low current densities which it has been necessary to use. With a low current density it is necessary to keep a length of wire in the galvanizing bath for perhaps two hours whereas with the current densities employed in the present process it is possible to galvanize the wire in a much shorter time.

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Tin seems to be indispensable to the human race and it has been instrumental in civilizing the world in a manner surpassed only by iron and copper. So far no substitute for tin has been found.

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*U. S. Patent, 1,059,233, Apr. 15, 1913.

## A New Pyrometer for Molten Metal.

A new form of pyrometer for determining the temperature of molten metals has recently been placed upon the market by the Brown Instrument of Philadelphia, Pa., the well known makers of pyrometers and recording instruments. This instrument is of the thermo-electric type and is adapted for registering the temperature of melted copper, brasses, bronze, aluminum, zinc and other metals and alloys.

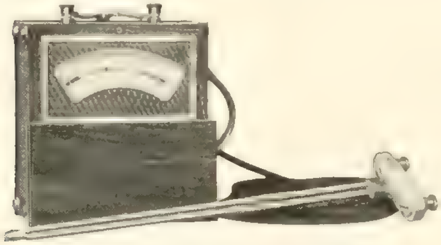

Fig. 1. The New Brown Pyrometer.

This company has been experimenting for some time in an effort to produce a thermo-couple that will withstand for a reasonable length of time the action of molten metals. They have, after a series of experiments, been able to produce such a couple and which is formed of a nickel alloy in the form of rods one-quarter of an inch in diameter. The rods are introduced directly into the molten metal. On account of this large cross-section, the actual size of which is shown in Fig. 1, the life of the couple has been greatly increased. The usual diameter of the thermo-couples used for pyrometers is one-eighth of an inch.

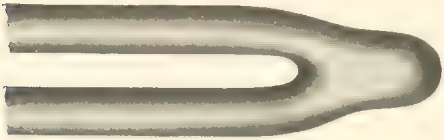

Fig. 2. The Thermo-Couple.

In conjunction with this thermo-couple, a high resistance portable indicating instrument is used which is unaffected by changes in the length of the wire connecting the thermo-couple with the instrument, and which is sufficiently strong for ordinary brass foundry service.

It has long been appreciated that if a reasonable life could be secured from a pyrometer, all foundries and those who melt metals would use them. The necessity of knowing the actual temperature of molten metal is now becoming more and more apparent. The pouring temperature has a direct bearing upon the castings produced and it usually determines whether the casting itself shall be good, bad or indifferent. There is a stated pouring temperature for every casting and this can only be found by the use of the pyrometer. The eye gives only an approximation.

This form of pyrometer, with its long life should be of interest to everyone who has to deal with molten metals. It will enable melters to produce uniform results continuously, as it has long been appreciated that, given the same metal, same method of melting and the same conditions in other respects, as follows in manufacturing establishments, the only variable factor is the pouring temperature; and with the pyrometer, this ceases to be uncertain.

## Chinese Antimony and Its Analysis.

In a paper read before the London Section of the *Society of Chemical Industry* on March 3rd., W. B. Schoeller describes the method of smelting antimony ores in China. Some results of experiments on treating antimony ores are also given. Among other things he states that the results of his analysis of the Chinese antimony were as follows:

| | |
|---|---|
| Antimony | 98.200% |
| Arsenic | 0.148% |
| Iron | 0.146% |
| Copper | 0.025% |
| Lead | 0.006% |
| Zinc | 0.025% |
| Insoluble | 0.076% |
| Sulphur | 0.370% |

The author mentions that the antimony ores are quite plentiful in China and says: "Antimony ores occur in the south of Hu-Peh and part of Sze-chuen province, and in the provinces of Kwei-chow, Kwang-si, and Yun-nan. Roughly speaking, this vast antimony belt comprises the entire western half of China south of Yang-tsze-kiang."

China will probably be one of the largest producers of antimony in the future as this country has been found to contain enormous deposits of antimony ore.

## Early Electrolytic Copper.

Electrolytic copper, when first produced in the United States, was quite a different material from that now made. The process was not well understood and the maintenance of the solutions and current density were not as carefully looked after as they are at the present time. The solutions became loaded with arsenic, antimony and bismuth which deposited with the copper and contaminated it so that it was a material, in many instances, little better than the original product. Were it not for the gold and silver obtained from the copper by the electrolytic process, the operation could hardly have been called a success.

The copper produced by the electrolytic process was originally sold in the form of cathodes as it often is now, but then it was marketed exclusively in that form. The cathodes were very poor in quality and lacked uniformity. It was this lack of uniformity that caused brass manufacturers to look with great suspicion upon electrolytic copper at that time and their aversion to it was well founded. While some cathodes were found good, others were so bad that the brass made from them could not be rolled without cracking. The final result was that brass rolling mills refused to use the cathodes for making brass to be rolled and the only outlet for the copper was in brass foundries making sand castings. As the copper was usually satisfactory for this purpose without electrolytic refining, such an outlet was not considered satisfactory, particularly when this copper commands only the lowest market price of any grade.

In order to obviate this irregularity of the copper, the melting of the cathodes in large batches and then carrying through the refining process in the regular way, afterwards pouring into ingots, was tried. This modification proved quite satisfactory in that there could be obtained a large batch of many tons of copper of the same quality, and it could be tested before shipment to the customer. It was really a standardizing of the copper. The process is now universally used, and while some cathodes are sold, their amount is small compared with ingots.

The standardizing of the copper by melting the cathodes in a large batch failed, however, in the early days of the electrolytic copper industry for the reason that the cathodes themselves were so impure that the ingot copper was equally so. The regular refining process by rabbling and poling does not remove arsenic, antimony and bismuth appreciably. There were so few cathodes that were good that the proportion of bad ones overbalanced them and the resulting batch, formed by melting the large quantity of cathodes was impure and unsatisfactory for making good brass. Brass manufacturers, however, offset this to a certain extent by using a small quantity of electrolytic ingots with Lake Superior copper, and in this way, of course, the quantity of impurities was reduced so that they did not become harmful.

The cause of the poor copper was not understood at that time and it was only after considerable time had elapsed and special study had been given the subject that it was discovered that the cause of the difficulty was the presence of antimony, arsenic, bismuth, tellurium or other foreign metals in the cathodes. Once in the cathodes, they were not removed by any further refining in the regular way by melting and then rabbling and poling.

Early in the history of the electrolytic copper industry a concern was started in Ansonia, Conn., by L. L. Smith and called "The Electrolytic Copper Co." They were the second concern and possibly the first to start in this line of copper refining. They early found the difficulties previously mentioned. They had started late in the 80's and the following analyses were made from their cathode copper in 1888. After they had been in business for some time they began to realize that the cause of the difficulty was due to the presence of impurities in the copper. The following analyses were made on cathodes produced by them during the year 1888, and will illustrate the fact that while the copper was not as bad as it might have been, it still contained too much impurity for use in manufacturing the best grades of brass:

| *Sample No.* | *Bismuth* | *Arsenic* | *Antimony* |
|---|---|---|---|
| 1 | none | 0.210% | 0.007% |
| 2 | none | 0.180% | 0.008% |
| 3 | 0.003% | 0.004% | 0.060% |
| 4 | 0.005% | 0.003% | 0.070% |
| 5 | 0.004% | 0.003% | 0.060% |

Time and experience have now demonstrated that copper is equally as good, no matter what process is used for refining it, if it is equally pure. The early aversion to electrolytic copper was caused by the fact that the copper was not pure, when it was assumed to be so. When the amounts of arsenic and antimony were present in the quantities previously stated in the analyses, it would be impossible to produce the best grades of brass from it, or high conductivity copper wire.

Now things have changed and electrolytic copper is produced as good, and in many instances better than the Lake Superior brands, and the former aversion to it has nearly passed out of existence.

## A New Flat Type Recording Differential Pressure Gauge.

A new type of differential pressure gauge has been brought out by the Bristol Company of Waterbury, Conn. This of the recording, float type. It is the invention of Prof. Wm. H. Bristol of the company. It is used to record the head of water in tanks and boilers under varying pressures, and also the flow of water through a small orifice. The flow of gases is also obtained by it and in Fig. 3 is shown a 24 hour record of the flow of blast furnace gases.

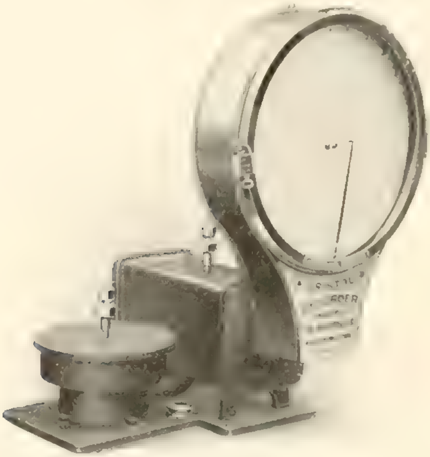

Fig. 1. The Complete Instrument.

Referring to Fig. 2, two pressure chambers A and B communicate through the connection C. A float D is located in the pressure casing A. The recording arm is directly connected with the end of the shaft F. Pipes H and I are used for making the connections. Mercury or water is employed in the pressure chambers, according to the use of high or low differential range. When the higher pressure is applied to the chamber B, the level of the liquid in this chamber is lowered, and that in the float chamber is raised carrying the float and recording arm with it. The circular chart, revolved by a clock movement, is then used to record the movement of the arm.

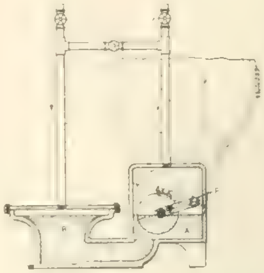

Fig. 2. View in Cross Section.

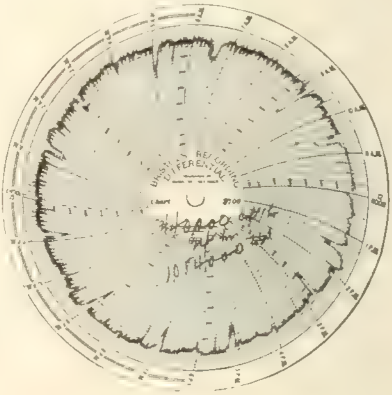

Fig. 3. A Chart.

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Bismuth is a peculiar metal in that it expands when cooled from its melted state. If melted in a glass tube or flask, it will crack it just at its solidifying point on account of the expansion which takes place.

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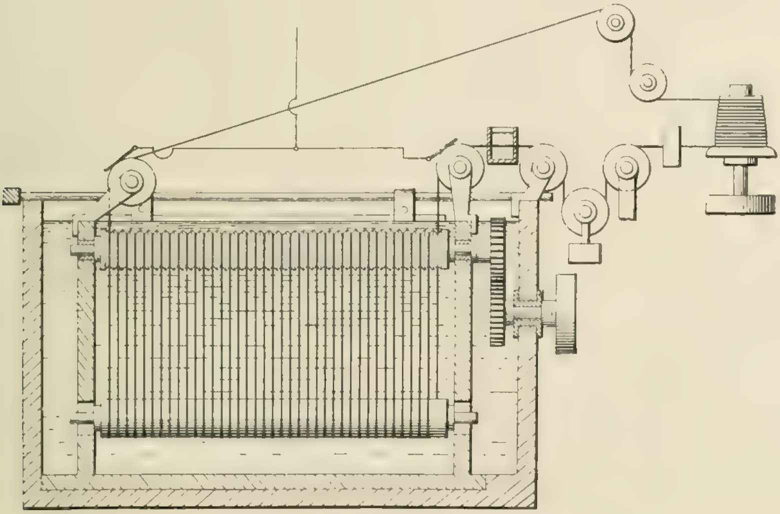
The pouring temperature of metals is a very important feature in casting them and usually decides whether the casting is going to be good or bad. This fact explains why castings of different fracture and different physical properties can be obtained from the same pot of melted metal. The difference in tensile strength will often amount to as much as 50 per-cent by pouring metals at different temperatures.

## Making Copper Wire by Electrodeposition.

The manufacture of copper wire by electrodeposition has, heretofore, not been successful although numerous attempts have been made to produce it. Patents have recently been granted to Wm. E. Gibbs of the Gibbs Company of Plainfield, N. J. for the manufacture of copper wire by electrodeposition which seems to be different from any process yet attempted.

The method necessitates the use of a fine copper wire for the starting point or base and the copper is deposited upon it while it is passed through the depositing tank. The manner in which this is done may be understood by referring to the sketch of the apparatus used and herewith shown.



Method of Making Copper Wire Electrolytically.

The fine copper wire is made endless and passed through a regular copper plating solution containing sulphate of copper and a little sulphuric acid. The wire passes over grooved rollers while going through the plating tank and which are operated by power from the outside. Various devices are used at the top of the tank for forming the connections with the electric current.

As the wire issues from the tank it is passed through a small rinse tank to remove any plating solution that adheres, and then goes to a reel. After it has passed around the reel a suitable number of times, it again enters the plating tank. The plating, therefore, is rendered continuous and may be carried on until the requisite thickness of copper has been deposited on the fine copper wire and so rendered it thicker and of the desired size.

## The Properties of Metallic Zirconium.

Zirconium is one of the so-called rare metals, although it is not rare in the sense that gold and platinum are considered; but it has been considered rare in the sense that it has heretofore been seldom obtained in the metallic condition.

E. Wedekind in *Annalen,* page 149, 1913, has studied the preparation and properties of metallic zirconium. The most satisfactory method of reducing it was found to be by means of metallic calcium. The zirconium oxide was mixed with finely divided calcium and heated in a vacuum. After treating the residue with various solvents, finely divided zirconium was obtained which was dried in a vacuum. This powder was melted in an electric furnace (kryptol furnace) and a mass with a good metallic lustre was obtained which could be polished and did not change in the air. The color is grayish white.

The specific gravity of the fused metal was found to be 6.44 and the melting point about 1530° C.

# Questions and Answers.

Question No. 1291. Can you give me a formula for a sterling-silver, 925 fine that will hold a polish and not tarnish as readily as sterling-silver alloyed with copper? I thought possibly aluminum might do.

*Answer.* There seems to be no difference in the tarnishing qualities of sterling-silver, made with metals other than copper, although we will say that the alloy of silver and aluminum does not tarnish quite as readily as ordinary sterling made with copper. All other metals such as zinc, nickel, cadmium, manganese etc. seem to change the tarnishing properties in its appearance also. The silver and aluminum alloy, however, is very difficult to cast. It gives a very dirty skillet and there seems to be no way of avoiding it. The oxide of aluminum is the cause.

Question No. 1292. In a recent article in The Brass World, I noticed that sodium hardens lead and 2% will cause the lead to ring. What would be the effect of using sodium in lead for plating steel by dipping? Would it produce a hard coating?

*Answer.* While sodium hardens lead, it also renders it very easily corroded. Lead containing 2% of sodium will, in contact with water, soon become covered with a greasy film of caustic soda. This is, we believe, an objection to the use of sodium for the purpose you mention.

Question No. 1293. What causes streaks on silver plated goods? These come from holes and joints and are black, comet-shaped marks?

*Answer.* The streaks are caused by dirt in the holes or joints. Buffing dirt, ordinary dirt, oil or other foreign matter will do it. Remove the dirt and you will have no trouble.

Question No. 1294. Are nickel anodes injured by passing through a fire? Our factory burned down a short time ago and some nickel anodes were in it. We should like to know whether they are injured at all and whether you think it safe to use them.

*Answer.* The anodes are not injured in any way. The only effect of the fire on them will be to coat them with smoke or soot, and dirt. Clean them off in the potash kettle and scour if necessary and your anodes will be as good as new. Fire will have no effect on the anodes except to actually melt them and then it would only change their shape. We doubt whether your fire was sufficiently hot to melt them.

Question No. 1295. In brass rolling mills is it customary to burn the sweepings and rubbish obtained from various portions of the plant? We have heard this is being done but we should think it would not pay.

*Answer.* It is now customary, in the large brass rolling mills, to burn the sweepings and other forms of so-called ""rubbish" obtained from the various parts of the plant. This applies more particularly to the sweepings from the mill floor, as there are some kinds which would not pay to treat. The object is to obtain what brass and copper is in the rubbish or sweepings and it is found that there is a sufficient quantity to pay for treating it. Pieces of sheet, wire, slivers, cracked ends, gate-ends, rods, and many other small kinds of scrap will be found in it. These are dropped on the floor while metal is being rolled, carted or worked. It will surprise one to find how much will be obtained from such sweeps, and previous to burning them it was the common practice to throw them on the dump without burning. Undoubtedly thousands of dollars worth of brass and copper were formerly lost in this manner. The furnace used for this purpose is simply a muffle-furnace and the refuse burned in an iron pan. The ordinary annealing muffle is generally used and it is quite suitable for the purpose.

Question No. 1296. What is the best method of melting gold that has been obtained from a cyanide solution by the zinc process?

*Answer.* You will have to use a flux in melting the gold in order to make it unite in a solid mass. A clay crucible is preferable as nitre can then be used for purifying it after it has been melted. Place the gold in the bottom of the crucible and a little borax on it so that when melted there will be a layer of melted borax about an eight of an inch in depth. Too much borax is not harmful but is unnecessary. When melted, throw in a few pieces of nitre (one at a time and wait for each to act). This will remove the last traces of zinc in the gold and leave it quite pure. There is apt to be some zinc left in the gold and in addition, a little lead is present from an impurity in the zinc. The nitre will remove both of these metals.

Question No. 1297. What is the metal used for separating zinc from the refuse materials obtained in making die castings? The alloys used in these articles, as well known, is principally zinc and the drosses and skimmings, of course, are of practically the same nature as those obtained in galvanizing. We would like to reclaim our own drosses and skimmings as we are making die castings.

*Answer.* We fear you will not find it profitable to attempt to reclaim your drosses and skimmings from your die casting operations. The only practical method of reclaiming them is to treat them in the same manner as zinc ore is smelted. That is by heating it in a retort with coal and distilling out the zinc and then condensing the zinc fumes. All zinc ore is smelted in this manner and the zinc drosses and skimmings, obtained from galvanizing are treated in the same manner. A plant is somewhat costly and will never pay on a small scale. You do not have enough drosses and skimmings to make it worth while.

Question No. 1298. What is the best method of cleaning steel shells used in automobile lamps? We are now using naptha and the shells are cleaned before japanning. We have heard of hot potash, muriatic acid, etc. and wish the quickest way to clean them. These stampings are full of machine oil and grease, grit, dirt, etc. The shells must be thoroughly cleaned before japanning.

*Answer.* Your method is now excellent for removing the greater part of the oil and grease and naptha is the most rapid way to remove such foreign matter on the shells. The only objection to its use is the fire risk and the insurance companies will not usually allow it to be used in factories except in fire-proof buildings constructed especially for the purpose. Naptha, however, does not remove all the greases and oil as it always contains the grease and oil in solution, that has been dissolved, and the film of this naptha, evaporating on the surface, leaves a similar film of oil and grease on the shells. You should supplement your naptha, therefore, with a potash or similar alkali for cleaning the last traces of oil and grease from the shells after they come from the naptha kettle. This supplementary operation, of course, will leave the shells perfectly clean for japanning.

QUESTION No. 1299. What is the object of using graphite stirrers and skimmers? We have heard these are used quite extensively in making brass, but we have never used them in our own brass foundry. If there is any advantage in them we should like to know it.

*Answer.* Graphite stirrers and skimmers are used to some extent in the brass rolling mill and brass foundries and the object of using them is to prevent the entrance of iron into the molten metal in which they are used. Iron skimmers are apt to introduce iron into the various metals and for the best quality of brasses and bronzes, the presence of the iron thus introduced is injurious. This is particularly true of such metals as German-silver, cartridge and spinning brass, etc. Graphite stirrers should always be used in making phosphor-bronze as the phosphorus in the metal attacks iron rapidly. Graphite stirrers and skimmers last a long time if not carelessly handled and broken.

QUESTION No. 1300. What is the best method of lacquering a silver plated mesh-bag? Can it be dipped satisfactory?

*Answer.* Lacquering by dipping is the best and quickest method. You should obtain a lacquer made particularly for dipping and for silver.

QUESTION No. 1301. We have a customer who is using large quantities of brass fittings. We make the castings for him and he does the machine work himself. He is complaining about the brass being hard at times. The mixture we are using is as follows:

A hardening is made of:

| | |
|---|---|
| Lead | 22 ℔s. |
| Zinc | 45 ℔s. |
| Tin | 4 ℔s. |

We use 1 lb. of this hardening to every 4 ℔s. of scrap copper wire. In addition we use a little phosphor-copper for a deoxidizer. What makes the metal hard?

*Answer.* Your mixture is not a good one as it does not contain enough tin to harden it and make it work well. Although you have enough lead, this will not answer in rendering the mixture sufficiently free cutting unless you have enough tin in the mixture. The following is a far better mixture than yours and your customer will never complain about its lack of free cutting qualities. It will cast well as you mention that your metal does not run well which is undoubtedly the case on account of the lack of tin in it:

| | |
|---|---|
| Copper | 85 ℔s. |
| Tin | 5 ℔s. |
| Lead | 5 ℔s. |
| Zinc | 5 ℔s. |

QUESTION No. 1302. I have some iron castings which are to be plated with nickel. The castings are coated with graphite and seem to have been cast in a graphite mold. How can I remove this graphite or black-lead before plating or is it impossible to remove it?

*Answer.* The black-lead or graphite on the iron castings did not come from a graphite mold as these are seldom used, but from powdered black-lead put on the sand mold for rendering the castings smooth. You can remove it by pickling. Pickle the castings in a mixture of 2 parts of water and 1 part of muriatic acid and the graphite will come off as it is only on the surface. If possible scrub or scour the castings afterwards.

QUESTION No. 1303. We are doing considerable galvanizing and the amount of dross which accumulates bothers us. We find that about 6 inches forms every week in the bottom of the galvanizing kettle. We use the highest grade of spelter and do not overheat the kettle to any extent. Is there any way of preventing the formation of the dross?

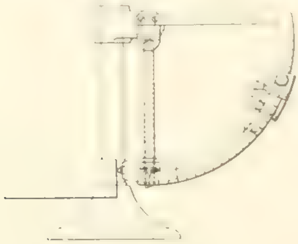
*Answer.* We regret to say that you will not find it possible to prevent the formation of zinc dross in galvanizing. It is caused by the alloy of the zinc with the iron kettle. Every one who does galvanizing has it. Graphite kettles have been tried, and while they prevent the formation of zinc dross, they are a failure on account of their cost and liability of breakage. The only way you can reduce your quantity of zinc dross is to be careful in heating your kettle. The hotter the bottom of the kettle, the more readily the zinc alloys with the iron in it. Forcing the fire underneath frequently causes large quantities of dross to form.

QUESTION No. 1304. I have been electrogalvanizing some steel roofing nails. These have a large flat head of sheet-steel. While the zinc deposits on the top it refuses to plate under the head. What is the reason for this?

*Answer.* We should say your difficulty was caused by using your electrogalvanizing solution too weak so that it does not ‘throw” under the head. Add more sulphate of zinc to it so that it contains about 4 lbs. to the gallon and then add about 2 oz. of sal-ammoniac. We think you will then have no trouble.

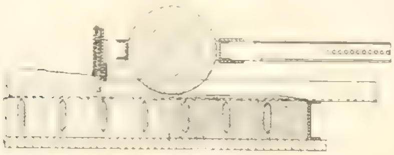
## Patent Abstracts.

1,057,850, Apr. 1, 1913. APPARATUS FOR TESTING HARDNESS. Josef Kirner of Stuttgart, Germany. Assignor to the Norma Compagni G. M. B. H. of Cannstat-Stuttgart, Germany. An apparatus for testing the hardness of metals. The apparatus acts by the [illegible] of rebound of a falling weight which strikes the metal to be tested. The weight is suspended pendulum fashion, so that it can fall from a given height against the article to be tested. The height to which the pendulum rebounds serves as a measure of the hardness and is read off on the scale.



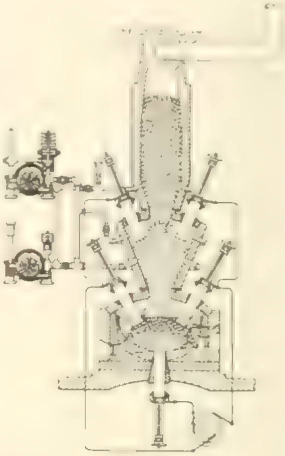
1,059,611, Apr. 22, 1913. LIQUID FUEL BURNER. Henry Clay Jordan of Seattle, Washington. An oil burner of the pressure type. The essential feature is in the tip which has spiral grooves in it so that a more complete mixture of the oil and attomizing gas (steam) is obtained.

1,058,078, Apr. 8, 1913. ROLL RAMMING APPARATUS. H. P. Macdonald of Jersey City. Assignor to the Snead & Co. Iron Works of Jersey City, N. J. A method of ramming the sand in a sand mold used for casting metals. The method is to use a roll on the top of the mold and pass it over while forced down upon the sand.



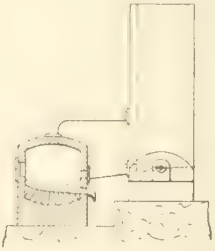
1,057,187, Mar. 25, 1913. POLISHING MIXTURE OR COMPOSITION. Herbert Tolputt of Sheffield, England. A polishing composition of the regular oxide of iron compounds (rouge) but which has metallic lead incorporated with it. Slaked lime is also used. The metallic lead is said to give it improved polishing properties.

1,057,213, Mar. 25, 1913. ELECTRIC FURNACE AND METHOD OF OPERATING SAME. George Hillard Benjamin of New York City. An electric furnace more particularly adapted for ore smelting. The object of the furnace is to render the operation continuous. The furnace is of the arc type.

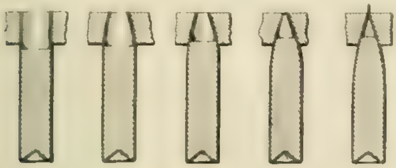


1,059,954, Apr. 22, 1913. PROCESS OF MAKING SELF LUBRICATING JOURNALS. George L. Thompson of Los Angeles, Cal. A metal bearing with graphite inserts. The patent is upon the method of making the bearing and especially on the manner of forming and placing the graphite inserts.

1,058,941, Apr. 15, 1913. PROCESS FOR TREATING COPPER. David Wesley Blair of New York City. Assignor to the Metallurgical Research Co. of the same city. A continuous type of furnace which is designed so that the walls are not rapidly deteriorated. The construction of the furnace is the principal feature of the patent, but a gas or oil flame is used and special means are employed to oxidize the copper and then reduce the oxide formed in another portion of the hearth.



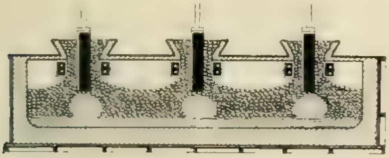
1,059,212, Apr. 15, 1913. PROCESS OF MAKING METAL CLAD BULLETS. C. H. A. F. Lockhart Ross of Balnagown Castle, County of Ross, Scotland. A method of making a jacketed bullet. The bullet is covered with the thin metal sheet, which is to be the covering, and then swaged in a swaging machine. The bullet is coated or covered by this method completely at both ends. While any metal may be used, it is customary to use a nickel alloy, like cupro-nickel.



1,059,354, Apr. 22, 1913. METHOD OF PRODUCING TUBES. Heinrich Ehrhardt of Dusseldorf, Germany. A method of producing metal tubes by forcing a mandrel or plunger through a tubular billet while held. The feature of the patent lies in the form of the mandrel or plunger.

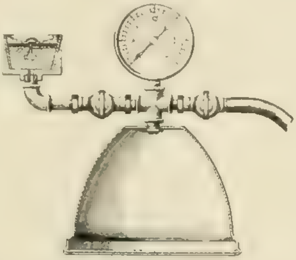
1,059,620, Apr. 22, 1913. METAL CORE FOR USE IN CASTING HOLLOW BODIES. Wilhelm Kurse of Wilhelmshütte, Neustadt on the Rubenberge, near Hanover, Germany. A collapsible core for use in casting hollow bodies. The feature lies in the central core, which, when removed, allows the collapse of the outside.

1,057,239, Mar. 25, 1913. ELECTRIC FURNACE. Alois Helfenstein, of Vienna, Austria-Hungary. A multiple electric furnace of the arc type. A long electric is placed at the bottom of the furnace and several vertical electrodes pass through the top. The bottom and sides of the furnace are water-cooled.

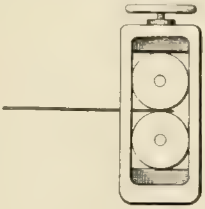


1,059,709, Apr. 22, 1913. PROCESS OF PRODUCING LOW CARBON NICKEL ALLOYS. Eugene A. Byrnes of Washington, D. C. Assignor to the Electrometallurgical Co. of Chicago, Ill. A process for producing low carbon ferro alloys containing nickel, and which is accomplished by heating or melting with oxide of nickel. This reacts with the carbon, and oxidizes it out of the alloy.

1,055,343, Mar. 11, 1913. APPARATUS FOR CASTING. Fred Lloyd Mark of Chicago, Ill. Assignor to the Ransom & Randolph Co. of Toledo, Ohio. An apparatus for making small castings, such as, for example artificial teeth. The metal is forced into the mold by means of pressure created by a vacuum, and at the same time, a vacuum is created inside of the mold, which allows the metal to penetrate the remotest crevice of the casting. The manner of creating the vacuum is the essential part of the invention.



1,057,571, Apr. 1, 1913. PROCESS OF MAKING COMPOSITE FOILS. Adolphus C. Meier of St. Louis, Mo. An improvement in making composite foils which consists in placing the foil of metal between paper, attaching the edges and then passing through rolls. The foils are then united, thereby, into one composite foil.



1,059,674. Apr. 22, 1913. ART OF FORMING AND ATTACHING CAST METAL HANDLES TO CUTLERY. Joseph F. Lamb of New Britain, Conn. Assignor to Landers, Frary & Clark. The process is applied to attaching aluminum handles to table cutlery or similar kinds. The handle is first cast in a metal mold and then slotted for the blade. The blade is then placed in the slot and the whole placed in a press and the joint forced down so that the blade and handle are forced together and firmly held.

1,059,499, Apr. 22, 1913. ELECTRIC FURNACE. Ernesto Stassano of Turin, Italy. An electric furnace of the arc type and which is mounted on pivots so that it can be turned when it becomes necessary during the operation of the furnace.

# Trade Items.

The plant of the Bay State Stamping Co., Chandler St. Worcester, Mass., manufacturers of stamped metal goods, was damaged by fire on Apr. 14th. to the extent of $25,000.

The New York Graphite Company are to erect a plant for the refining of graphite at Harcourt, Ont. Canada. It is reported that the plant will have a capacity of 50 tons of ore per day.

The chemical trade of Great Britain is an extensive one and Davis Bros., 265 Strand, London, W. C., England, have recently issued a new edition of their "Chemical Trade Directory of Chemical Manufacturers, Merchants, Brokers and Agents and Makers of Chemical Plant in Great Britain and Ireland." The directory contains 458 pages and is an extensive treatise.

The general offices of the E. B. Van Wagner Mfg. Co. of Syracuse, N. Y., manufacturers of die castings, have been moved to their factory at Fayetteville, N. Y., a suburb of Syracuse. An office will be maintained in the Union Building at Syracuse but all business will be transacted from the main office at Fayetteville, N. Y. Extensive improvements have been made in the factory and the manufacturing facilities have been increased and the factory enlarged.

The North American Smelting Company of Philadelphia, Pa., manufacture a large variety of special metal alloys in the form of ingots for the trade. Phosphor-bronze, manganese-bronze, "Climax" bronze, and yellow brass ingots are made in large quantities in the well known high grade maintained by this company. Their "N. A. Philadelphia" babbitt-metal has always been a standard babbitt that has won the approval of the trade. Their "Crescent" type metals, solders, and other white metals are already widely known and they also manufacture the "Crescent" brand of brazing solder.

Victor C. Lassen, formerly of the Vanadium Metals Co. of East Braintree, Mass. and Groton, Conn. recently returned from a trip to Russia and reports that the Russian Government is to spend nearly a billion dollars for a new navy and the money has already been appropriated. The law of Russia compels all material to be manufactured in that country and this seems possible, Mr. Lassen says, with the exception of the necessary bronze work. He states that there are only two small foundries capable of turning castings acceptable for the work and the largest that can be made is only 1500 lbs. Mr. Lassen had conferences with the Minister of Marine and has under consideration the establishment of a foundry in that country for making large castings for the new navy. Mr. Lassen believes that Russia has a great future before it and compares it with the United States, seventy-five years ago.

The factory of Robert E. Lee & Co., of Newark, N. J., electroplaters and colorers for the jewelry trades, have moved to 355 Mulberry St.

The Stimpson Scale & Electric Co. of Northville, Mich. manufacturers of computing scales, have increased their capital stock from $50,000 to $100,000.

The Chambray Carburetor Company has been incorporated in Detroit, Mich. with a capital stock of $50,000 to manufacture carburetors. The incorporators are: John H. Chambers, James W. Mowbray and Charles H. Bennett.

The Hendee Mfg. Co. of Springfield, Mass., manufacturers of motorcycles, have purchased a tract of land on State St. in that city and on which will be erected some large extensions. This will be used, among other things, for the brazing and aluminum department.

The Bristol Company of Waterbury, Conn., manufacturers of recording instruments, pyrometers and steel belt lacing, are sending out to the trade, their new Bulletin No. 169 on the "Bristol Counters" for recording the revolutions or oscillation of machinery.

The Bethlehem Steel Co. of South Bethlehem, Pa., have purchased the plant and business of the Fore River Shipbuilding Co. of Quincy, Mass., and will continue to operate it. Just what effect this will have on the plant, as far as the brass foundry is concerned, is unknown. The company have a large number of orders unfilled and in process of construction and these will be completed. It is stated that Admiral Bowles will remain at the head of the company.

The Indiana Electric Company of Indianapolis, Ind., which were recently incorporated, has acquired from the Indianapolis Brass Co. many patents, devices and unfilled orders for the electrical goods manufactured by the latter company. A factory is to be built at 1022 East Michigan St. for manufacturing these electrical specialties. The general manager of the new company is James H. Drew, who was one of the organizers of the Indianapolis Brass Company. This company will continue in the jobbing brass casting business as before.

John C. Wiarda & Co., Green & Provost Sts., Brooklyn, N. Y. are now manufacturing nickel anodes for the trade and their plant has been fully rebuilt for this purpose. It was greatly damaged by fire about a year ago and they were somewhat handicapped at that time, but are now in full operation again. In addition to the manufacture of nickel anodes, zinc carbonate, copper carbonate, copper sulphate, nickel salts, potash, cyanide, and a full line of platers chemicals are manufactured. Their anodes are fully guaranteed in their nickel contents. Correspondence is solicited and prices will cheerfully be given.

The plant of the Best Foundry Co. of Bedford, Ohio, manufacturers of stoves, is to be enlarged by an extension 180 x 200 feet and another 50 x 200 feet. This is one of the plants of the American Stove Co.

The Prest-O-Lite Company of Indianapolis, Ind., manufacturers of acetylene tanks and apparatus, are to build an eastern works in Springfield, Mass. This will consist of a two story building, 63 x 89 feet. Electroplating is carried on at their plant.

A new plant for the manufacture of electrical devices and specialties is to be built by Remy Brothers of Anderson, Ind. This firm recently sold out their interest in the Remy Electric Company of that city and which is one of the largest manufacturers of magnetos in the country.

The Haydenville Company of Haydenville, Mass., manufacturers of plumbers' brass goods, have recently issued a new catalogue of high grade brass faucets and valves for the plumbing trade. This catalogue is 7 x 9 inches and contains 120 pages of half tone cuts.

The reorganization of the Pratt & Cady Company of Hartford, Conn., manufacturers of valves, is progressing rapidly and the recent report of the receiver shows a good condition and outlook. The receivers will not dispose of the company as a going concern, as first expected.

The New York Buff Co., manufacturers of polishers', platers' and grinders' supplies, moved on May 1st. to their new factory at 210-212 Canal St., New York City. The large and rapid increase in their business made this change necessary. They now have increased facilities for handling their business. Very prompt attention will be given to all orders.

The Garford Engineering Co. which was recently incorporated in Elyria, Ohio, to manufacture aluminum alloys and products, have acquired the American rights for the manufacture of a new aluminum alloy known as "Aeromin" and which is controlled by the Aero Metal Syndicate of England. It is proposed to use this alloy for the manufacture of cast aluminum goods, plumbing fixtures and cooking utensils. It is stated that the alloy is superior to the ordinary aluminum mixtures for this purpose.

Owing to the increase in the volume of business, Chas. F. L'Hommedieu & Sons Co., 24-30 South Clinton St., Chicago, Ill., manufacturers and dealers in plating and polishing supplies and equipment, have been obliged to purchase a tract of land for a new factory. This land is located at Ogden Ave. and 46th. Ave. The building will have a frontage of 110 feet and will contain 14,000 sq. feet of floor space. The building will be two stories high and switching facilities on the C. B. & Q. R. R. will be had. It is expected that the new factory will be ready by May 1st. 1914. The present office and salesroom at 24-30 South Clinton St. will be retained.

The Penn Chandelier Works of Reading, Pa., manufacturers of chandeliers, have moved from Pearl St. to 538 Franklin St.

The Joseph Dixon Crucible Co. of Jersey City, N. J. are sending out to the trade a new booklet entitled "Graphite for the Boiler". This will be sent to those who desire it.

The General Electric Company is planning to spend $1,000,000 in improvements at their works in Pittsfield, Mass. within the next two years.

A new plant is to be built at Wheeling, W. Va., by the Underwood Typewriter Co. of Hartford, Conn. It is reported that this will be used for making the castings for their typewriters.

H. A. Winters, 109 Oliver St., Newark, N. J., has commenced the manufacture of jewelry novelties. He formerly made pearl buttons. His factory has been enlarged for the increase in manufacturing.

The Norfolk & Western R. R. are equipping a plating, coloring and lacquering department at their shops in Roanoke, Va. It is expected that this department will be in operation within a short time.

The Barnes Safe & Lock Co. of Pittsburgh, Pa., have purchased a site in Washington, Pa., and on which a new plant is to be built. The present quarters in Pittsburgh, Pa., have proved too small for their increasing business and it has been found necessary to erect this new plant.

The Titanium Alloy Mfg. Co. of Niagara Falls, N. Y. announces to the trade that hereafter the sale of its products will be in charge of the general-manager, Andrew Thompson with offices at Niagara Falls, N. Y. A. C. Hawley will represent the company in the Pittsburgh district and is located in the office of the company in the Oliver Building.

The Cleveland Electro Metals Company has been organized in Cleveland, Ohio and will carry on the smelting and refining of the non-ferrous metals. The plant will be located at 25th. St. and Mulberry Ave. The Cleveland Research and Test Laboratories will be associated with the company and have charge of the technical end and testing. The incorpora tors of the company are: H. G. Wellman, John W. Brown, F. S. Wellman, W. G. Wilcox, and C. W. Hill.

Herman Gehnrich of Brooklyn, N. Y., manufacturers of the "Gehnrich" section ovens for lacquering, japanning, enameling, core-baking, etc., has moved to his new factory at 60-62 Franklin Ave. in that city. Increased facilities are now had for the manufacture of his work The trade is invited to inspect his factory and see the careful manner in which the ovens are made. All kinds of sheet metal work, such as stacks, pans, exhaust systems for buffing and polishing wheels, tanks, etc., are also manufactured The business was founded in 1880. The ovens are of the Underwriters Approved Type.

The Wallaceburg Brass & Iron Works of Wallaceburg, Ont., Canada are to make extensive additions to their plant.

C. Shilling & Sons of St. Paul, Minn. have purchased a site in Elmwood, Winnipeg, Canada, and are to erect a plant for the manufacture of stoves.

The Dominion Bronze Mfg. Co. is to erect a new foundry at Preston, Ont. Canada. J. W. Patterson, formerly of New Castle, Pa. is to be superintendent of the plant.

The Dominion Fireless Cooker Co. has been incorporated in Toronto, Canada with a capital stock of $40,000 and will manufacture fireless cookers and aluminum ware.

The business of the Simons Brothers Co. of Philadelphia, Pa. has been reorganized and the manufacture of gold and silver thimbles, novelties, and other goods will be carried on as in the past.

A large addition to the plant of the Canadian Hanson & Van Winkle Co. at Toronto, Canada will shortly be made. This will consist of a building 50 x 225 feet and four stories high. It will be used for the manufacture of dynamos and other electroplating supplies and equipment.

The C. Colnik Mfg. Co. of Milwaukee, Wis has been incorporated with a capital stock of $50,000 to manufacture ornamental metal work. This company has been in existence for many years under the same name, but, heretofore, have not been incorporated. No change in the policy of the company or plant will be made.

Brass founders and others who melt and desire to know the pouring temperature, now acknowledged as a necessary feature in casting, should investigate the new "Brown" pyrometer, made by the Brown Instrument Company of Philadelphia, Pa. This pyrometer in addition to accuracy, has the additional feature of exceptional durability.

The contract has been awarded by the Post-Office Department at Washington to the Triner Scale & Mfg. Co. of Chicago, Ill. for 25,000 spring scales at 95 cents each. A contract was also awarded to the Toledo Scale Co. of Toledo, Ohio for 500 automatic scales at $19.50 each. The scales are to be used in the various post-offices throughout the country for use in connection with the parcels-post. The automatic scales will be used only in the larger offices.

The Hoskins Manufacturing Company of Detroit, Mich. have recently issued a new catalogue of their "Hoskins Thermo-Electric Pyrometers". This catalogue is also a compendium of useful information and contains 48 pages about the instruments made by this company and the manner of using them. The catalogue will be sent to those who are interested in the subject and will be found of much value to anyone engaged in melting or otherwise treating metals by heat. The office of the company is at 453-471 Lawton Ave.

The Baltimore Sterling Silver Buckle Co. of Baltimore, Md. have moved their plant to 593 North Gay St. Silver novelties are manufactured.

It is reported that a new Factory will be built by the Dutchess Specialty Co. of Poughkeepsie, N. Y., for the manufacture of aluminum specialties.

The plant and personal property of the Trumpin Mfg. Co. of Detroit, Mich., manufacturers of motorcycles, was sold at auction on Apr. 28th. This company recently went into bankruptcy.

The L. Davidsburg Co., manufacturers of jewelry, and now located in New York City, are to retire from business. They moved to New York City from Providence, R. I. some time ago.

The Paramount Brass Manufacturing Company has been incorporated in Cleveland, Ohio with a capital stock of $10,000. William M. Behn and W. F. Grimmell are among the incorporators.

The Montpelier Cup & Metal Works of Montpelier, Ind. have been incorporated with a capital stock of $50,000 under the name of the Montpelier Manufacturing Company. Pressed metal goods were previously made.

A plant for the manufacture of stamped metal goods is to be started in Steveston, British Columbia and nickel plating is to be carried on. Samuel Cory is the organizer of the company

The Rundle Mfg. Co., of Milwaukee, Wis., manufacturers of plumbers' brass goods, has been reorganized with a capital stock of $100,000. The new officers are: President, Robert T. Hazelwood; vice-president, Frank E. Rundle; secretary and treasurer, Henry Held.

The annual meeting of the Mauston Aluminum Company of Mauston, Wis. was recently held and the following officers were elected: President, M. L. Bunnell; vice-president, W. B. Curran; secretary, Walter Marvin; and treasurer, B. F. Broezel. It is reported that additions to the plant will be made in the near future.

The Wisconsin Foundry Company of Manitowoc, Wis. are preparing plans and specifications for their new aluminum foundry to be erected at 16th. and Franklin Sts. in that city. The foundry is to be 50 x 100 feet, finishing room 50 x 100 feet and offices 40 x 50 feet. The buildings will be of brick and steel construction.

The Imperial Brass Foundry & Mfg. Co., recently incorporated in Plainesville, Ohio, has obtained the old Foyer plant in that city and in which manufacturing will be carried on. The company will manufacture a line of steam fittings, plumbers' brass goods, and will also make brass, bronze and aluminum castings. The officers of the company are: President J. I. English; vice-president, John Kennedy; and secretary and treasurer, M. T. Williams.

Extensions are being made to the plant of the Kenton Hardware Mfg. Co. of Kenton, Ohio.

Large additions to the plant of the Duncan Electric Mfg. Co. of Lafayette, Ind. are shortly to be made.

A four story factory is to be erected by the American Watch Case Co. on King St., Toronto, Canada.

The Keystone Electric Co. of Reading, Pa. have equipped an electroplating department at their works on Peach St., in that city.

A new factory is to be built on Hammond St., by the Matthews Mfg. Co. of Worcester, Mass., manufacturers of stove trimmings and stamped metal goods.

The plant of the Grant Jewelry Co., 83 Page St., Providence, R. I., manufacturers of jewelry, has been purchased by the new firm of King & Leary and a line of bracelets and similar jewelry novelties will be manufactured.

The Electrical Fire Alarm Co. has been organized at Two Rivers, Wis. with a capital stock of $25,000. A plant is to be erected. Electrical devices for fire detection will be manufactured.

A new factory is being erected by the Howard Miniature Lamp Co. of Newark, N. J., at Springdale Ave. and 19th. St. Small electric lamps and accessories are manufactured.

The new brass foundry which is being erected by the William A. Hardy & Sons Company of Fitchburg, Mass. is 50 x 90 feet and two stories high. This will include the office. The manufacture of screen plates, railway castings and brass, bronze and aluminum castings is carried on.

A new brass foundry is to be built by the Allentown Brass & Mfg. Co. at Rittersville, Pa. This company was recently incorporated with a capital stock of $20,000. The manufacture of brass castings and hardware will be carried on. The incorporators are J. T. C. Krasley, Jacob Pudliner and Daniel D. Trexler.

The National Company has been organized in Waterbury, Conn. for the manufacture of brass goods. M. J. Byrne is the president of the company, A. A. Tanner vice-president and F. C. Smith secretary. A ten acre tract of land has been obtained on the Watertown branch of the N. Y. N. H. & H. R. R. upon which, it is stated that a factory will shortly be erected.

The Cleveland Blowpipe & Manufacturing Co., 2096 West Third St., Cleveland, Ohio, manufacturers of dust collecting systems, are sending out to the trade a new booklet describing their appliances. These comprise adjustable hoods for grinding, polishing and buffing wheels, dust separators, exhaust fans etc. The booklet contains much useful information on the size of pipes and the method of installing. It will be sent to those who desire it.

The Hampe Mfg. Co. has been incorporated in Indianapolis, Ind. with a capital stock of $20,000 to manufacture gasoline gauges.

The DePasse Manufacturing Co., manufacturers of silver deposit wares and sterling silver goods, have moved their factory from New York City to Imlay St., Brooklyn, N. Y.

The Central Foundry Company of Syracuse, N. Y., recently incorporated in that city for the manufacture of brass and aluminum castings, are to make a specialty of parts for vacuum cleaners.

The Gray & Davis Company of Amesbury, Mass., manufacturers of automobile lamps and electric starting and lighting devices, are to build a new plant in Cambridge, Mass. This will comprise a building 80 x 380 feet, five stories high.

The Yale & Towne Mfg. Co. of Stamford, Conn., manufacturers of locks, builders' hardware and chain-blocks, are to increase their capital stock by $1,000,000 issue of common stock and are offering to their stockholders the opportunity of obtaining at par, one new share for every two shares held.

The new factory which the C. J. Root Company of Bristol, Conn. is now building, will contain the plating, buffing and lacquering rooms. This new building is 40 x 120 feet and three stories high. Brass hinges, stamped metal goods and revolution counters are manufactured.

## Personal.

John F. Fleckenstein has taken charge of the plating and polishing departments of the Lisenby Co. of Fresno, Cal., who have recently enlarged their plant.

## Obituary.

Henry H. Lester, for thirty-two years in charge of the plating department of the Wm. Rogers Manufacturing Company of Meriden, Conn., manufacturers of silver plated flatware, died on Apr. 20th.

A. C. Stiles, formerly proprietor of the Stiles Metal Co. of New Haven, Conn, which was absorbed by the Magnus Metal Co., died on March 27th. Until the last year, he was in charge of the brass foundry of the Wells Chemical Bronze Works of Worcester, Mass.

Olin Scott died in Bennington, Vt. on April 28th. aged 81 years. He was a manufacturer of powder mill machinery and at one time conducted a brass foundry in connection with the business. He was also the proprietor of the Bennington Machine Works which made a specialty of powder mill machinery. Their business was very extensive in this line. For a time he was interested in the Du Pont powder company and built mills for them and acted as their expert. He established his first powder mill in Marquette, Mich. in 1869.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98-99% | ℔. | .22 |
| Acid, Acetic, pure, 30% | ℔. | .07 |
| Acid, Arsenious (White Arsenic) | ℔. | .20 |
| Acid, Benzoic | ℔. | .55 |
| Acid, Boracic (Boric), pure | ℔. | .12 |
| Acid, Hydrochloric, see Acid, Muriatic. | | |
| Acid, Hydrofluoric, 30% | ℔. | .04 |
| Acid, Hydrofluoric, 50% | ℔. | .10 |
| Acid, Muriatic, 20° | ℔. | .02 |
| Acid, Muriatic, c. p., 20° | ℔. | .07 |
| Acid, Nitric, 38° | ℔. | .05⅝ |
| Acid, Nitric, 40° | ℔. | .05⅞ |
| Acid, Nitric, 42° | ℔. | .06¼ |
| Acid, Nitric, c. p., | ℔. | .08 |
| Acid, Sulphuric, 66° | ℔. | .01¾ |
| Acid, Sulphuric, c. p. | ℔. | .06 |
| Alcohol, Wood | gal. | .60 |
| Alcohol, Denatured | gal. | .55 |
| Alum | ℔. | .04 |
| Aluminum, Metallic, in Ingot | ℔. | [illegible] |
| Ammonium Sulphate | ℔. | .07 |
| Aqua-Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | ℔. | .04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | ℔. | .06¼ |
| Ammonia Water, c. p. | ℔. | .08 |
| Ammonium Carbonate, lump | ℔. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | ℔. | .12 |
| Ammonium Hydrosulphuret | ℔. | .30 |
| Ammonium Sulphate | ℔. | .07 |
| Ammonium Suphocyanate | ℔. | .60 |
| Amyl Acetate | gal. | 3.50 |
| Antimony | ℔. | .09 |
| Arsenic, Metallic | ℔. | .10 |
| Arsenic, White (Acid Arsenious) | ℔. | .20 |
| Argols, White (Cream of Tartar) | ℔. | .31 |
| Asphaltum, Commercial | ℔. | .05 |
| Asphaltum, Egyptian (Bitumen) | ℔. | .30 |
| Benzine | gal. | .15 |
| Benzol, Pure | gal. | .60 |
| Bismuth, Metallic | ℔. | 2.25 |
| Bitumen, see Asphaltum. | | |
| Blue-Vitrol, see Copper Sulphate. | | |
| Borax, Crystals or Powdered | ℔. | .10 |
| Borax Glass | ℔. | .35 |
| Cadmium, Metallic | ℔. | .85 |
| Carbon Bisulphide | ℔. | .10 |
| Calcium Carbonate (Precipitated Chalk) | ℔. | .10 |
| Chrome-Green | ℔. | .50 |
| Copper, Lake, [illegible] | ℔. | .15[illegible] |
| Copper, Lake, [illegible] | ℔. | .15⅞ |
| Copper, Electrolytic, [illegible] | ℔. | .15[illegible] |
| Copper, Electrolytic, [illegible] | ℔. | .15½ |
| Copper, Casting, [illegible] | ℔. | [illegible] |
| Copper, Casting, [illegible] | ℔. | [illegible] |
| Copper Acetate (Verdigris) | ℔. | .35 |
| Copper Carbonate, dry | ℔. | .25 |
| Copper Sulphate (Blue-Stone) | ℔. | .09 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | ℔. | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | ℔. | .15 |
| Emery Flour | ℔. | .04 |
| Emery, F F & F F F | ℔. | .03 |
| Flint, powdered | ℔. | .01 |
| Flour Spar | ℔. | .01¼ |
| Fusel-Oil | gal. | 3.50 |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | ℔. | .30 |
| Gum Guiacum | ℔. | .26 |
| Gum Mastic | ℔. | .70 |
| Gum Sandarac | ℔. | .35 |
| Gum Shellac, brown | ℔. | .50 |
| Gum Shellac, white | ℔. | .60 |
| Iridium | oz. | 83.00 |
| Iron Perchloride | ℔. | .25 |
| Iron Sulphate (Copperas) | ℔. | .05 |
| Lead Acetate (Sugar of Lead) | ℔ | .15 |
| Lead, Pig | ℔ | [illegible] |
| Lead, Red | ℔. | .12 |
| Lead, Yellow Oxide (Litharge) | ℔ | .12 |
| Liver of Sulphur, see Potassium Sulphide. | | |
| Manganese, Ferro, 80% | ℔. | .10 |
| Manganese, Metallic, pure | ℔. | .75 |
| Magnesium, Metallic | ℔. | 1.50 |
| Mercury Bichloride (Corrosive Sublimate) | ℔. | 1.16 |
| Mercury, Metallic (Quicksilver) | ℔ | .39 |
| Mercury Nitrate | ℔. | 1.50 |
| Mercury Oxide, yellow | ℔. | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | ℔. | .08 |
| Nickel Carbonate, dry | ℔. | .60 |
| Nickel Chloride | ℔. | .50 |
| Nickel Metallic | ℔. | .45 |
| Nickel Sulphate (Single Salts) | ℔ | .12 |
| Nitre (saltpetre), see Potassium Nitrate. | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Paraffine | ℔ | .15 |
| Phosphorus, yellow | ℔. | .40 |
| Phosphorus, red | ℔. | 1.10 |
| Pitch | ℔. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Chloride | oz. | 46.00 |
| Platinum Metallic | oz | 48.00 |
| Potash by-Alcohol, in sticks | ℔. | .60 |
| Potash, Caustic | ℔. | .05½ |
| Potassium Bichromate | ℔. | .14 |
| Potassium Bitartarate (Cream of Tartar) | ℔. | .31 |
| Potassium Carbonate (Pearlash) | ℔. | .10 |
| Potassium Chlorate | ℔. | .15 |
| Potassium Cyanide | ℔. | .25 |
| Potassium Iodide | ℔. | 2.25 |
| Potassium Nitrate (Nitre or Saltpetre) | ℔. | .10 |
| Potassium Permanganate | ℔. | .17 |
| Potassium, Red Prussiate | ℔. | .60 |
| Potassium, Yellow Prussiate | ℔. | .24 |
| Potassium Sulphide (Liver of Sulphur) | ℔. | 15 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | ℔. | .70 |
| Pumice, Ground | ℔. | .05 |
| Quartz, Powdered | ℔. | .01 |
| Rosin, Yellow | ℔. | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .60[illegible] |
| Silver Nitrate, crystals | oz. | .50 |
| Soda-Ash | ℔. | .05 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | ℔ | .15 |
| Sodium Carbonate (Sal-Soda), crystals | ℔. | .02 |
| Sodium Hydrate (Caustic Soda) | ℔. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | ℔. | .45 |
| Sodium Hyposulphite ("Hypo") | ℔. | .04 |
| Sodium Metallic | ℔. | .90 |
| Sodium Nitrate | ℔. | .05 |
| Sodium Phosphate | ℔. | .09 |
| Sodium Silicate (Water-Glass) | ℔. | .04 |
| Soot, Calcined | ℔. | 15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | ℔ | .05 |
| Tin Chloride | ℔. | 43 |
| Tin, Metallic | ℔. | [illegible] |
| Turpentine, Venice | ℔ | 35 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal | 15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | ℔. | 45 |
| Wax, Carnauba | ℔. | 70 |
| Whiting (Ground Chalk) | ℔. | 02 |
| Zinc, Carbonate, dry | ℔. | 19 |
| Zinc, Chloride | ℔. | .12 |
| Zinc, Sulphate | ℔ | .06 |
| Zinc (spelter) | ℔ | .05[illegible] |

# THE BRASS WORLD AND PLATERS' GUIDE

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## Fuel-Oil and the Brass Industry.

The recent rise in the price of fuel-oil, which took place at the beginning of the present year and resulted in practically doubling the price of the oil, did not, we are pleased to say, have the depressing effect on the brass industry that was expected. It was presumed that this enormous increase in price would result in a very large decrease in the use and consumption of fuel-oil in this line of trade; and it was anticipated that the price would practically prohibit its use for brass melting and for annealing. We are very glad to say that its effect has hardly been noticeable and, indeed, plants are now being equipped with oil for melting and annealing, even in the face of this already increased price.

There is only one deduction to be made from this condition and it is that fuel-oil has many more advantages than has generally been known. Did it not have advantages, manufacturers would not continue to use it. The very fact that they have stood nearly a 100 per-cent increase in price certainly indicates an advantage in oil fuel that has not generally been admitted. The installation of new melting and annealing furnaces, using oil for fuel, and by those who have thoroughly investigated the subject, likewise shows that oil is a valuable fuel in the brass industry.

In melting, oil has these advantages: First, it is very low in sulphur and metal can be melted with it with less contamination from this element than with coal or coke. Second, there are no ashes to wash with the accompanying variable and frequently extensive losses. Third, a greater number of "heats" may be obtained from a furnace than coal or coke will give for the reason that there are no ashes to interfere with the draft. Fourth, there is no coal or coke to transport or ashes to cart away. Fifth, rapid melting can be obtained even on days when the draft would be poor in melting with coal or coke.

In annealing, the oil supplies a fuel that is nearly free from sulphur and is the nearest approach to wood, (so long employed for this purpose) known. Even at its high price, there seems to be no decrease in the quantity of oil used for annealing in the brass rolling mill industry. The use of wood for this purpose has almost ceased, on account of its scarcity and accompanying cost, and oil has taken its place.

In some lines of trade, the increase in the cost of oil has resulted in abandonment, but it does not appear to have had this effect in the brass industry.

## The Usefulness of Black Lacquers.

Black lacquers are now extensively used, but there are many manufacturers who do not fully appreciate their great merits. In fact, it is not an uncommon thing to find persons who believe that such finishes, produced by a black lacquer, is not lacquer at all but colored metal, obtained either by direct coloring or by plating.

The black lacquers are a comparatively new product in the lacquer trade as it is only within the past five years that they have made their permanent appearance in the metal world. While they have been known for a much longer period, it is only recently that they have been used and have been fully appreciated.

The black lacquers, as produced to-day, are made in practically three grades: Glossy, half matt or dead, and dead. The glossy black is a lacquer that is black, but, when dry has a glossy surface like ordinary lacquer. The half matt or half dead dries with a surface that is half way between the glossy and dead surfaces and it is this lacquer that is now so extensively used on automobile hardware and accessories. It has a particularly pleasing appearance. The dead lacquer dries with a real dead surface without any lustre at all.

The glossy lacquer can be used for a large variety of surface effects, but the most satisfactory finishes seem to be obtained by means of the half dead lacquer as it dries with a surface closely resembling hard rubber. The dead lacquer is not useful for ornamentation, but is used on the interior of automobile lamps where it is not desired that any light shall be reflected and for similar purposes.

The black lacquers have a number of excellent features: In the first place, they are intensely black, and when applied to a bright metal surface cover it so well that no metal is revealed. They dry rapidly in the air, if no facilities are had for baking, and the appearance leaves little to be desired. They may be applied with a brush, spray or by dipping.

One of the remarkable features of the black lacquers is their durability. They not only stand the most severe usage, which would damage any varnish, but oils, gasoline, benzine or water have no appreciable effect on them and the weather likewise fails to injure them. It is for this reason that they stand so well on the lamps and other accessories of an automobile.

The lacquers are so satisfactory that it is remarkable that they are not even more extensively used than they are. One needs only to try them to be convinced of their advantages. And in addition, they are made by all lacquer manufacturers so that one need have little trouble in obtaining them.

Zinc has been found the best protection for iron and steel against rust. It owes its value to the fact that it is electropositive towards iron or steel, and when it is present as the coating, it corrodes in preference to the iron or steel, thus protecting it.

According to the latest investigations, tungsten has the highest melting point of any metal and is about 5400° F. This fact is the reason why it can be used for electric light filaments with such success. It does not melt at a bright red heat or, in fact what would be called practically white hot.

A use which has lately developed for German-silver and which appears to hold out considerable promise, as far as consumption is concerned, is for automobile work. It is used on the better grade of cars in place of nickel plated brass and scouring will not injure it, as it is apt to do on the nickeled brass.

# Making Aluminum Automobile Castings at the Works of the United Foundry & Machine Company, at Bridgeport, Conn.

An excellent example of the enormous expansion of the aluminum casting industry within the past five years is the works of The United Foundry & Machine Company of Bridgeport, Conn. It is also evidence of the ability of the officers of the company and it is remarkable that in so short a time a business of such a magnitude could have been developed. The works have been in operation for less than a year and the rapid growth may be fully appreciated when it is known that 105 hands are now employed. While a general run of aluminum and high grade brass and bronze castings is produced, the majority of the work is aluminum castings for automobile work.

The United Foundry & Machine Company was started late in the spring of 1912 and a plot of ground obtained on Bruce Ave., Bridgeport, Conn., adjoining the N. Y. N. H. & H. R. R. The situation is such that the raw materials, in the shape of aluminum and other metals, and molding sand, oil and a general line of supplies, may be delivered direct at their plant in carload lots. In addition to the raw materials, the finished products may be likewise shipped direct from the plant and no carting is required. This feature is of great value to the company as most of their orders for automobile work are in such quantities that carload shipments are continuously made. In Fig. 1 is shown the exterior view of the plant from the adjoining railroad.

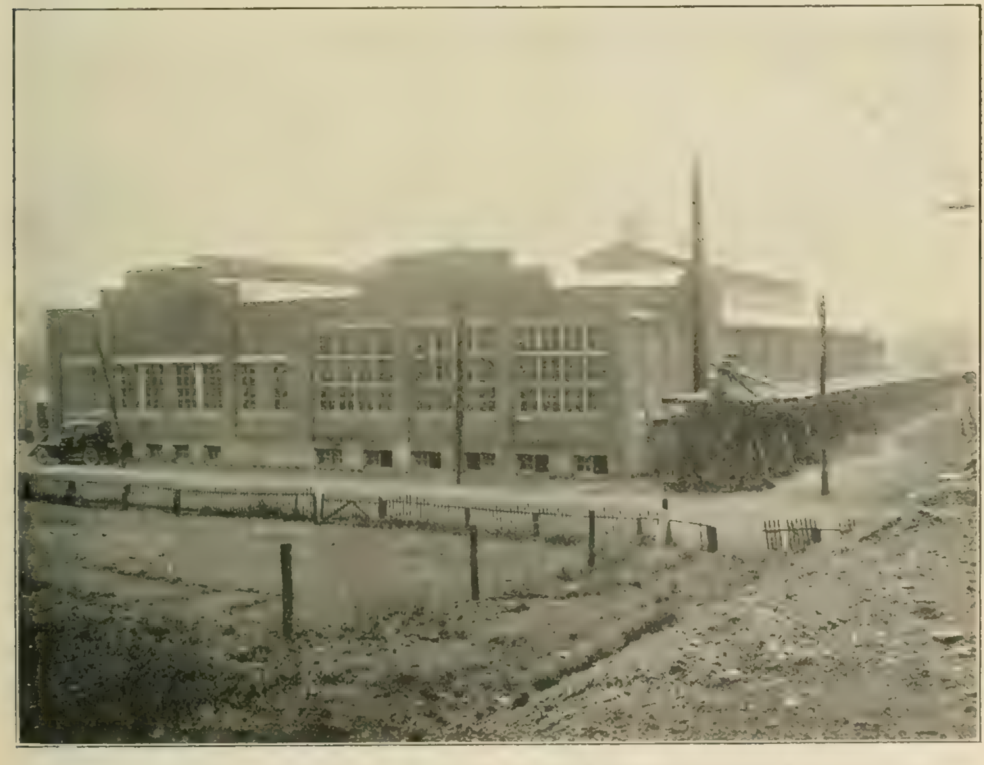

Fig. 1. Exterior View of the Plant of the United Foundry & Machine Company, Bridgeport, Conn.

The plant was designed with a view to lessening the labor of handling to the fullest possible extent as it was believed that much labor is unnecessarily expended in many plants in this direction, and that any reduction in the cost of handling, at this day of close calculations, means a corresponding reduction in

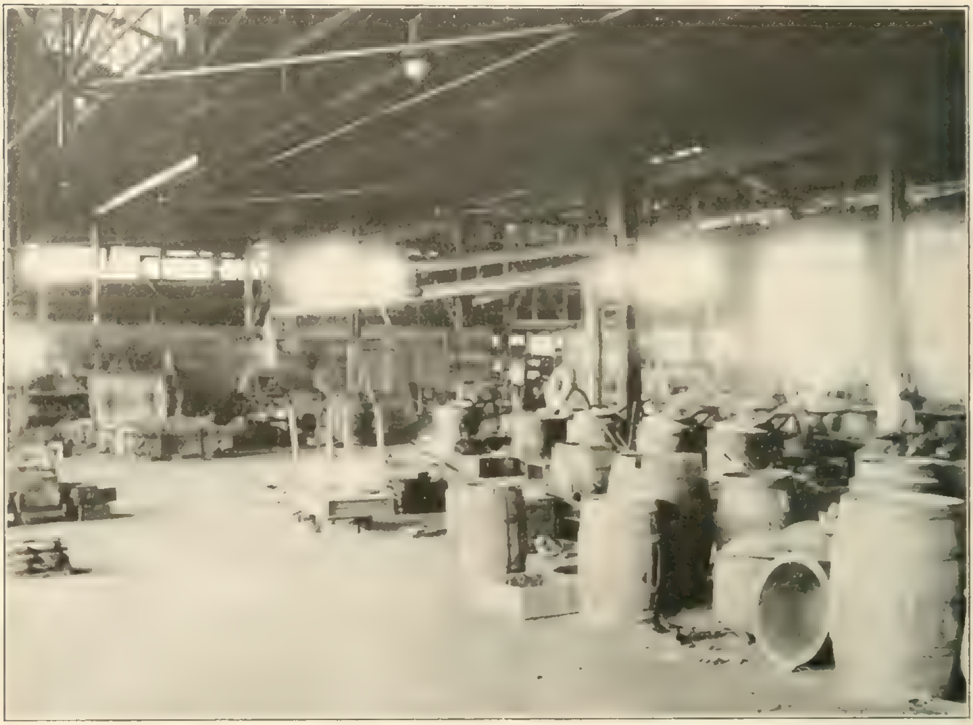

Fig. 2. Interior View of the Foundry of the United Foundry & Machine Company, Bridgeport, Conn.

costs worth considering. The building is of brick with a steel trussed roof and of sufficient height to give excellent ventilation. In the design of the building particular stress was laid upon the light as it was believed that molders can do far better work and more of it in a well lighted building. On this account, the windows were made as large as possible and the interior is excellently lighted.

The interior of the foundry is shown in Fig. 2 and while it was believed to be of ample proportions for some time to come, it is now completely filled with work. The floor, instead of being of the regulation sand or dirt

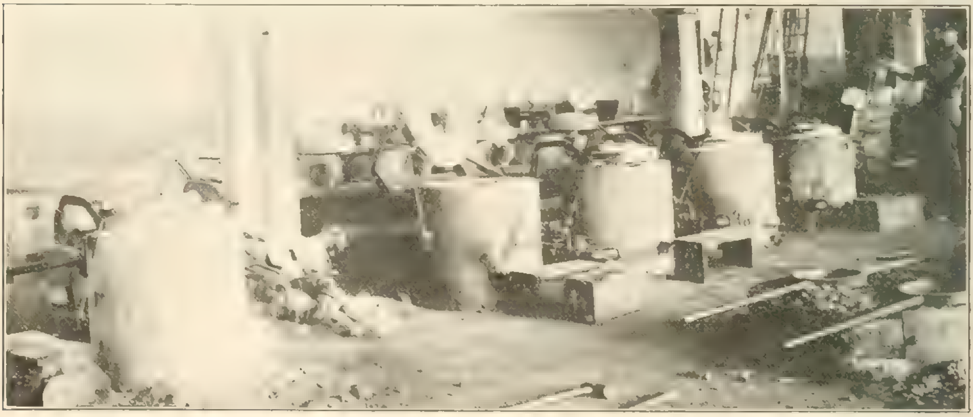

Fig. 3. Battery of "Steele-Harvey" Oil Melting Furnaces for Melting Brass and Bronze.

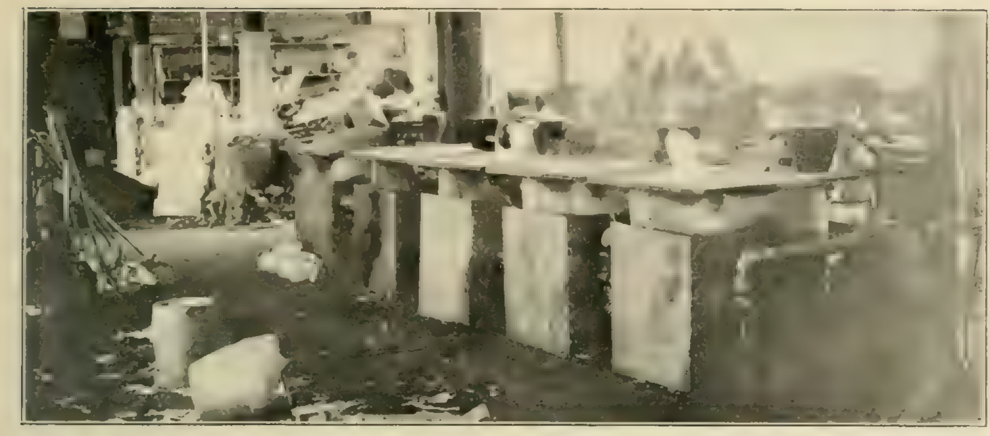

Fig. 4. Battery of Furnaces for Melting Aluminum and Using Oil for Fuel.

type, so commonly found in foundries, has been covered with cement and it gives a hard, smooth floor which is easily kept clean and what metal is spilled or thrown on it is easily reclaimed by riddling the sand in the sweepings. This feature is of value, when one stops to consider the amount of metal that is continually dropped on the floor, and on a dirt floor it is tracked in and much of it is lost. The use of the cement floor is also of value in molding as it enables a molder to use his sand to a better advantage.

The furnaces for melting are situated in the middle of the foundry floor and consist of two batteries. One is used for melting the aluminum and the other is employed for brass and bronze. In both types of furnaces, as well as for the core-ovens, fuel-oil is used. Even

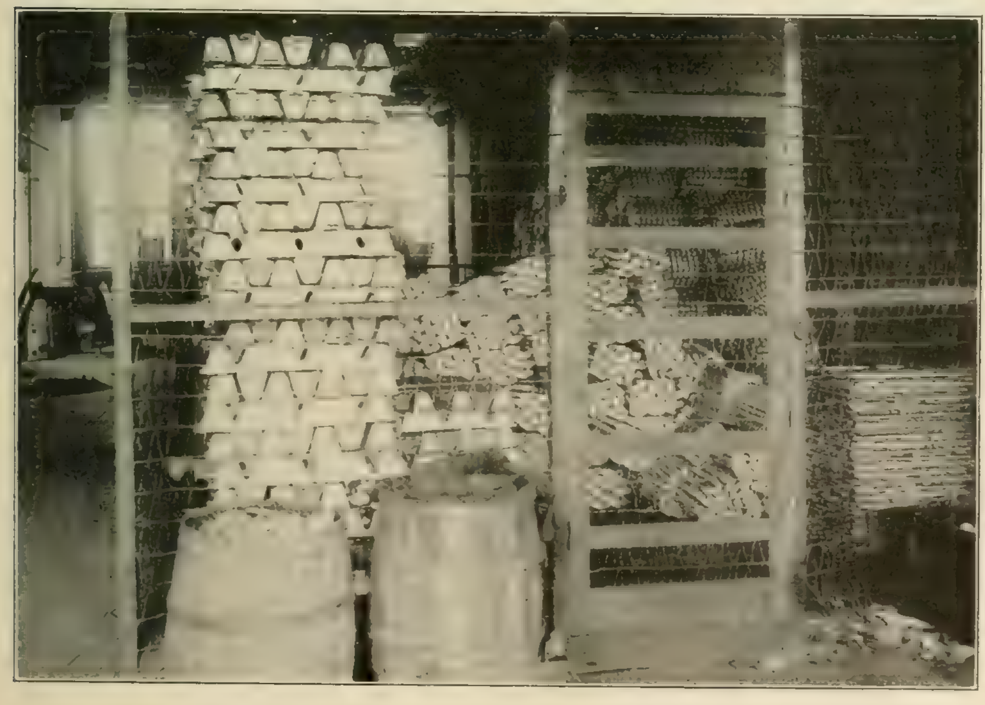

Fig. 5. Stock of Aluminum and Method of Storing the Metals.

at the present high price of oil, this fuel has been found preferable to coal or coke as there are no ashes to wash, with the accompanying waste of metal, and a greater number of heats per day can be obtained. The fact that oil fuel has been found satisfactory by The United Foundry & Machine Co. is indicated by the fact that it is used exclusively, both for melting the metal and for core baking.

The battery of furnaces used for brass and bronze melting are shown in Fig. 3. They are the "Steele-Harvey" type made by the Monarch Engineering & Mfg. Co. of Baltimore, Md. and crucibles are used exclusively. The furnaces are of stationary type and, if required, aluminum can be melted in them. It has been found more expedient, however, to use iron-pot furnaces for melting the aluminum and these are shown in Fig. 4. Iron pots are used for this purpose and the aluminum is ladled out by means of iron ladles, when the metal is melted and then poured direct into the molds. Much difficulty has been experienced by aluminum founders in obtaining iron pots which would give good results in melting the aluminum. Ordinary cast-iron does not seem to answer well, and, after much experimenting, this company has succeeded in obtaining a special kind of iron which answers admirably and from which a much greater number of heats can be obtained than with ordinary cast-iron. The use of cast-iron pots for melting aluminum is now increasing and nearly all the large aluminum founders are now employing them. They are cheap and last much longer than a graphite pot, and if care is used in heating them, the amount of iron taken up from them is so small that it is insignificant and has no appreciable effect on the strength of the castings. If, however, the kettle is allowed to overheat, and the ladles or stirrers are scraped repeatedly against the sides, considerable iron will be absorbed by the aluminum. The same is true of allowing the aluminum to remain in the pot for a long time after it has melted and to become overheated. The iron thus absorbed renders the aluminum brittle and imparts to it a coarse, crystalline structure with a low elongation or practically none at all. At the works of the United Foundry & Machine Company, great care is used in melting the aluminum to see that it does not become overheated. The ingots of aluminum may be seen in Fig. 4 and the pots are always kept full so that, under this condition, overheating is reduced to a minimum.

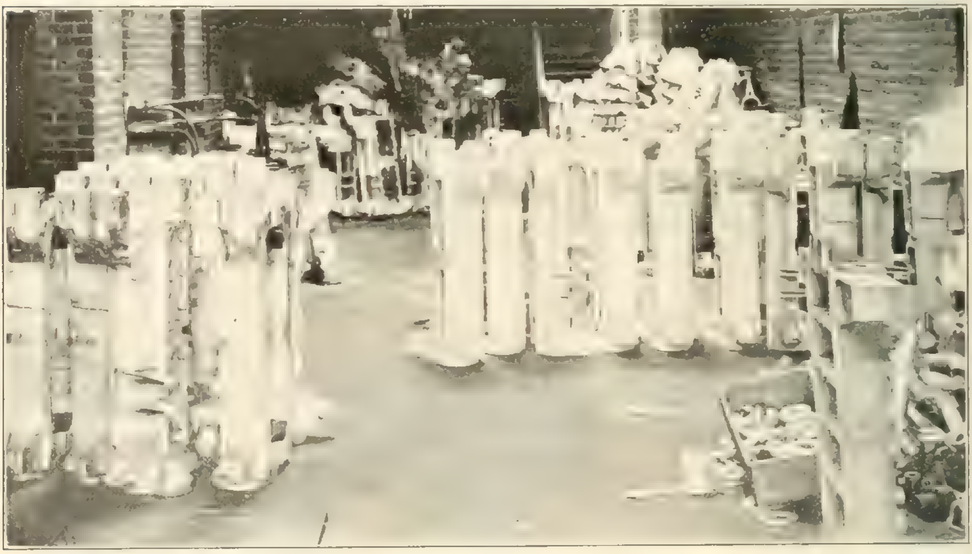

Fig. 6. Aluminum Crank Cases for Automobile Construction and Sand-Blasted Ready for Shipment.

The raw material used is shown in Fig. 5. Metals are kept in a separate room, built especially for the purpose and of wire netting. This enables it to be locked and to be free from any danger of theft. The aluminum used is principally imported and it has been a very satisfactory source of supply. The quantity of aluminum stocked is, necessarily, large, and is obtained in car-load lots.

The brasses and bronzes made are all of high grade and are composed of new metals in order to meet the specifications required and in this connection it may be of interest to know that the company now makes the crank cases for the Locomobile out of Government bronze. As far as known, all other automobiles use aluminum for this purpose but the Locomobile Company have always advocated the use of bronze on account of its extra strength. In Fig. 6 at the right may be seen one of these crank-cases.

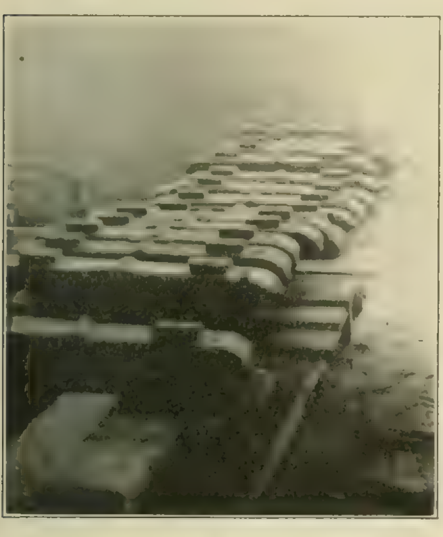

Fig. 7. Skin-Dried Cores for Use on Aluminum Castings.

The cores used for automobile work are shown in Fig. 7. As aluminum cracks readily when cooling from the molten condition, the cores must, necessarily, be soft, and on this account the larger cores are not dried clear through, but are placed on a bench, as indicated in Fig. 7, and the outside dried with a gas torch. Cores dried in this manner have the advantage of a soft interior, which will yield when the time arrives, and a dry exterior to prevent blowing as the metal strikes them. Small cores are dried clear through in the ordinary manner as it has been found unnecessary to go to the expense of skin-drying them.

The aluminum is cast entirely in green sand and this has been found satisfactory for aluminum work. It is yielding and allows free shrinkage upon the cooling of the casting, and is free from the cost attending dry sand work. While several different mixtures are used for making the aluminum castings, the one which automobile manufacturers employ for the majority of their work is what is known as "No. 12 Mixture" and consists of 92 per cent of aluminum and 8 per-cent of copper. It has been found that this mixture, while not quite as strong as other mixtures containing zinc, is the safest to cast as it is not subject to the cracking phenomenon that is experienced in the case of aluminum mixtures containing zinc. For large castings, the aluminum and copper mixtures are preferable, even though slightly deficient in strength. For small castings or those which are unimportant, the aluminum mixtures containing zinc can be used.

Large castings are always molded "flat" and with ample gates so that the metal can be poured at as low a temperature as possible. It has been found necessary, in order to obtain the desired physicial properties on aluminum castings which will have to meet specifications, to pour the aluminum at the lowest possible temperature at which it will make a good casting. This feature was one of the early obstacles in the way of making good aluminum castings and founders failed to take notice of the fact that the hotter aluminum is poured in sand, the less the tensile strength and other physical properties; but by pouring it at as low a temperature as

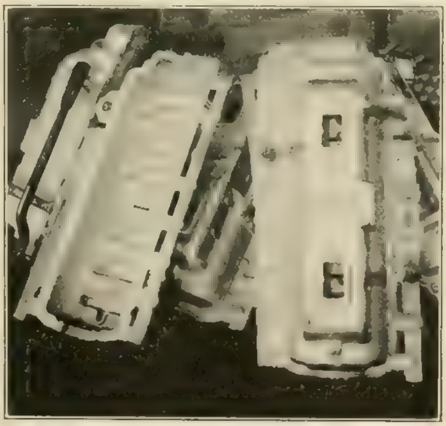

Fig. 8. Method of Gating an Aluminum Crank Case

possible, the maximum strength and elongation can be obtained. In Fig. 5 is shown an aluminum automobile casting and the manner of gating. Were this to be gated like iron or brass, it would not run unless the metal was quite hot, and then the strength and elongation would be found too low to meet specifications; but by gating along the side so that the mold can be filled quite rapidly, the aluminum can be poured at quite a low temperature and still have the mold fill readily. Risers, of course, are necessary on heavy portions to take up the shrinkage on such parts.

After the castings have been finished, they are sand-blasted. This treatment is applied to both aluminum and brass or bronze work. It has been found that the appearance of the castings is much improved by sand-blasting, and the surface is freed from any molding sand that may adhere to it. A uniform color is also imparted to the castings giving them an excellent and attractive appearance. The fact that the castings are sand-blasted when it serves only to improve the appearance indicates the care with which work is turned out. In Fig. 6 is shown a lot of finished crank cases ready for shipment. The quantity of this class of work produced may be appreciated when it is known that these castings, shown in Fig. 6, are shipped in car-load lots.

The character of the work turned out by The United Aluminum & Machine Company is indicated by the fact that the greater part of their product is shipped to Detroit automobile manufacturers which is, so to speak, the "home of the enemy" and were they not turning out a superior product, it could not be done. The growth which has followed the company since its inception in the early part of the year 1912, has been such that at the present time over one hundred hands are employed, which renders it one of the largest jobbing foundries in the United States.

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In casting fine bronze work, such as statues, plaques and art goods, it is unwise to use scrap metals, but the best quality of new metal should always be employed. The condition is analagous to the making of a steel die where the cost of the steel is but a few cents and the labor may be nearly a hundred dollars. If the steel cracks in hardening or does not stand the work, the labor is lost. The same is true of fine art work. The labor is the costly part of the operation.

## An Imitation Silver Deposit by Means of Copper and Tin.

An imitation white silver deposit may be obtained by depositing copper and tin together from a cyanide solution. This deposition is performed in the same manner as a brass solution would be done, except that tin is used in place of zinc.

It is well known that the alloys of copper and tin containing considerable tin are quite white and when they are deposited it is natural that the deposits shall be of the same whiteness. The alloys of copper and tin up to those containing about 85 per-cent of copper and 15 per-cent of tin, have a bronze color but after more tin is added, the color begins to become whiter. With 20 per-cent of tin, the color is quite light although it still has a bronze shade. When the tin content reaches 30 per-cent the true whiteness appears and when over this amount the whiteness is still present even up to practically pure tin. There are, therefore, very wide limits in the amount of tin that can be used for making the white copper and tin alloy. All the white alloys of these two metals are brittle.

To deposit the white copper and tin alloy, all that is necessary to do is to add tin to a cyanide copper solution until it plates the desired white color.

Take any good cyanide copper solution, which is in good working condition, for the base. Then dissolve some chloride of tin (tin salts) in a strong cyanide solution until no more will be taken up, or in other words it is saturated. This is best done by warming as the tin then dissolves more readily.

Now add this solution of tin in cyanide to the cyanide copper solution, little by little, until it gives a deposit of the desired whiteness. At first it will deposit a red bronze, then, as more is added, a light bronze is obtained. Afterwards the deposit will look like nickel, but as more is introduced the deposit will have the desired whiteness. Copper anodes should be used, and as the color falls off in whiteness, more of the cyanide tin solution should be added. This is the method of keeping the bath in good condition.

This deposit, of course, is brittle, but it can be used if not plated too heavily. For cheap work,in imitation of silver plate, it does very well on some classes of goods and may be deposited directly on iron or steel.

## Some Freaks of the Nickel Plating Barrel.

Nickel plating by the barrel is now extensively carried on and gives good results at a very much less cost than can be obtained by any other process. There are a number of good barrels on the market and their use has resulted in some queer freaks. These freaks, no doubt, have been found by all who have used the barrel method of plating for any length of time.

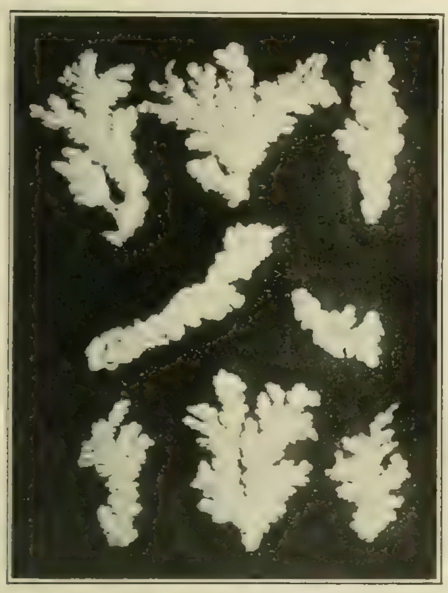


Fig. 1. Nickel "Trees" from a Nickel Plating Barrel.

In the use of the nickel plating barrel it is necesary to use some metal parts and these frequently are the cause of the freak deposit of nickel. The nickel will start from such a metal part, be it ever so small and grow. An example of this kind is shown in Fig. 1. The barrel, from which these deposits were obtained, was of the hexagonal type with wood staves. The nickel started to deposit on various portions of it in the form of "trees" which finally arrived to a considerable size. The largest of the "trees" shown in Fig. 1 were about 5 inches long. Electro-deposits, when they grow on a surface, take the form of "trees" and the formation is known as "treeing." Other metals besides nickel have the tendency to form "trees" and zinc is very apt to do it, particularly if there is no substance in the solution to minimize it. In the case of the "trees" shown in Fig. 1, the nickel started from a metal surface and then gradually took the shape shown. This formation, of course, took several months to grow.

In Fig. 2 is shown a large nickel formation which formed around the shaft and bushing of a nickel plating barrel. This likewise took a long time to form and well illustrates the manner in which the metal accumulates in an electrodeposit. It also shows how difficult it is to obtain a smooth deposit of such a heavy nature. There is always a tendency to form an irregular surface which, as the nickel continues to deposit, becomes more and more irregular.

In Figs. 3 and 4 is shown a very peculiar formation and indicates how "freaky" the electric current may be under some conditions. This formation or freak occurred in a nickel plating barrel with canvas sides. The use of canvas for very small work has proved quite satisfactory as it allows the free passage of the current and still retains small work. In this particular case, the plating barrel was used for nickel plating steel supporter trimmings. For some reason, possibly a burr on the goods, two of the articles adhered to the canvas when the contents of the barrel were dumped out, and then remained there for some time. The two articles attached to the canvas of the nickel plating barrel are shown in Fig. 3 and which were on the inside of the barrel. This lodging of the articles, however, was not remarkable, but the astonishing part of the matter was that, on the opposite side of the canvas, nickel deposited in the exact shape of the article, and to a considerable thickness. This formation on the opposite side of the canvas is shown in Fig. 4. It took place on the outside of the barrel.

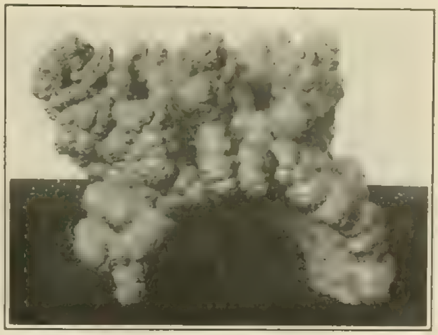


Fig. 2. Heavy Nickel Deposit Which Formed on the Shaft of a Nickel Plating Barrel.

Fig. 3. Peculiar Deposit Which Formed on the Canvas of a Nickel Plating Barrel. This View Shows the Interior.

The remarkable part of this freak formation was the fact that the nickel had deposited on the outside of the canvas with, apparently, no base to start it. The electrodeposition, seemingly, had started upon the canvas itself, by what might be termed "induction."

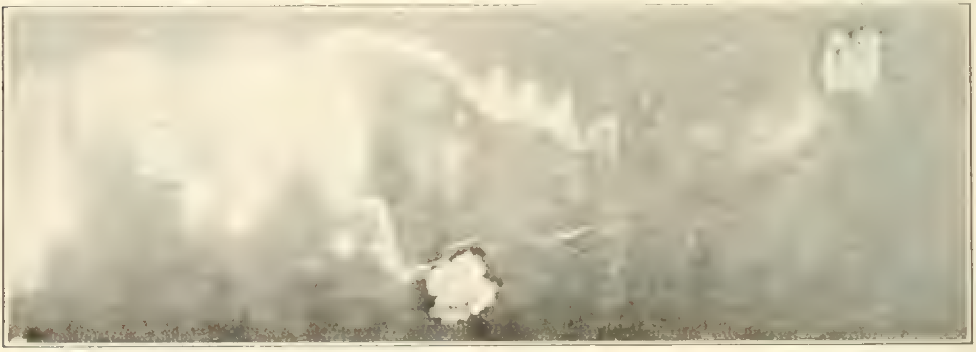


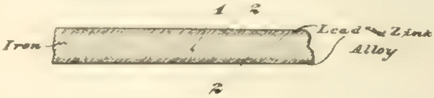
Fig. 4. The Outside of the Barrel, Showing How the Deposit Followed the Article Through the Canvas.

The formation of such "freaky" deposits in the nickel plating barrel should be stopped as soon as discovered for the reason that they continue to grow and waste more and more nickel. Otherwise, they do not appear to have any bad effect on the electrodeposition of the nickel.

## Coating Iron or Steel with a Lead and Zinc Alloy.

A process has recently been brought out for coating iron or steel with an alloy of lead and zinc for the purpose of rendering it rust-proof. An alloy of 95% of lead and 5% of zinc is used for the coating material. It is said that this alloy is sufficiently electropositive to iron or steel to prevent its corrosion under atmospheric influences; and in addition, it has the advantage of softness so that it will not scale off when the sheet metal or wire, which is coated with it, is bent. This feature would seem advantageous when wire or sheet metals are to be worked.

The process has been patented by George A. Goodson of Minneapolis, Minn., and the method of alloying the lead and zinc has also been previously patented by him. He states that by the ordinary methods of alloying the lead



and zinc, by melting the two together, it is impossible to alloy more than 1.60% of zinc with the lead. In a previous patent, a method was described in which the metals were melted together and a current of electricity passed through the bath. It is claimed that from 5 to 10 per-cent of zinc can be alloyed with lead in this manner

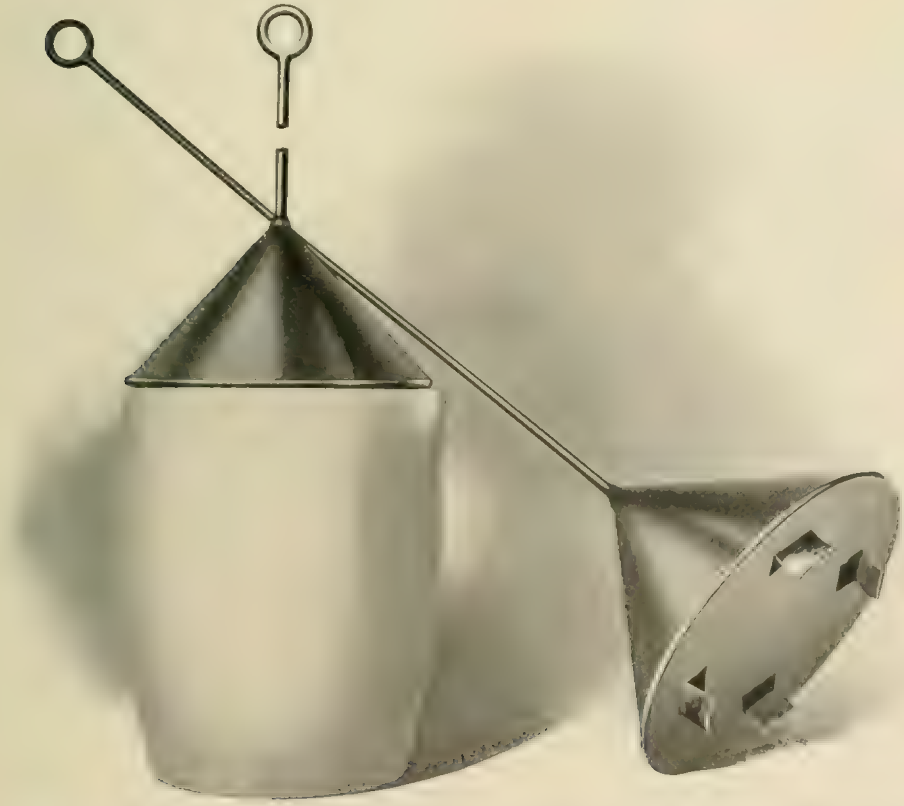
## A New Form of Cover for Charging Crucible Furnaces.

In melting metals in a pit furnace by means of coal or coke, it is necessary to set the crucible in the furnace, after a "bottom" of the fuel has been put in, and then shovel the coal around it. The coal or coke is packed around the crucible practically level with its top.

In charging the furnace in this manner, there is always danger of introducing pieces of the fuel in the crucible and it is a matter which requires careful work, on the part of a melter, to prevent it from going in. If ingot metal is placed in the crucible before introducing it into the fire, the pieces of fuel in it fall to the bottom and cannot be removed. Those which fall on top, however, can be picked out by means of tongs, although they are not always taken out.

The presence of coal or coke on the metal during melting is open to considerable objection as it introduces sulphur into the metal and this, it is well known, is a very injurious element. It is for this very reason that charcoal is used as a covering for the metal during melting. Many brass founders fail to appreciate the fact that the presence of coal or coke on the surface of the metal will injure it and the more that is present in the molten metal during melting, the more injury is done to it. Sulphur produces blowholes in the castings, causes them to crack on account red-shortness, and renders the melted metal dirty and drossy. In addition, it causes a dark or black skin to form on the surface of the castings.

A new form of crucible cover for charging crucible furnaces has recently made its appearance on the market and is herewith illustrated. It is intended to cover the crucible while the furnace is being charged with coal or coke and thereby to prevent any of the fuel from entering the crucible itself with



Cover Manufactured by the Crucible Fueling Cover Co. and Used for Placing on Crucibles When Charging the Furnace with Coke or Coal.

the molten metal. Not only does it prevent the fuel from entering the crucible, but renders the charging operation very easy for the melter. All that is necessary to do is to shovel the fuel into the furnace and the cover causes it to pass down to the sides of the furnace and distribute itself around the crucible.

The advantage of the cover may be readily appreciated upon inspection of the cut. It is made in a particularly substantial manner so that it will last indefinitely. The cone is made of sheet steel and the joint is welded. The handle is welded to the cone and the bottom is likewise welded to it, so that it is practically impossible for anything to work loose. It can [illegible] from the bottom to hold the cover on the pot during charging. The fact that the cover is made from [illegible] steel renders it very light and easily handled. No rivets at all are used in its construction. The weight complete is 6¾ lbs.

The cover is made in three sizes. The smallest size will fit crucibles from No. 20 to No. [illegible] The next size is made for No. [illegible] while the other two sizes will fit crucibles from No. 60 to No. 150.

The crucible cover is manufactured for the foundry trades by the Crucible Fueling Cover Co., 1796 North Ave., Bridgeport, Conn., and a patent is to be applied for upon it.

## Why a Zinc Coating is the Best Rust Preventive for Iron or Steel.

It is difficult for many persons to understand why zinc is the best rust preventive for iron or steel, and they believe it is on account of its cheapness that it is so extensively used. They have an idea that lead, being a cheaper metal, would answer far better, and as it is more non-corrosive than zinc, would protect the iron better. This is not a fact, however, as will subsequently be explained.

The very fact that zinc is a corrosive metal does not affect its properties when applied as a coating to iron or steel. Indeed, if it did not corrode, it would not be of value for such a purpose. When iron or steel, which has been coated with zinc, is exposed to the atmosphere, a galvanic action is set up, although, of course, extremely slight. Any two dissimilar metals form a galvanic couple, but as zinc is the most electropositive metal, the galvanic action between the zinc and iron is as great as could be obtained when iron is used for one of the metals composing the couple.

The result is, therefore, that with the slight galvanic action set up on galvanized iron or steel, when exposed to the atmosphere, a corrosion takes place. Did it not follow, then there would be no protection. In this case, the zinc being the electropositive metal, suffers corrosion at the expense of the electronegative metal iron. The effect is that the corrosion goes on with the zinc exclusively and the iron is not corroded at all, provided any zinc is left on the iron or steel. This condition takes place whether a light or heavy coating of zinc is present. The only advantage of a heavy zinc coating is that it will last longer, but under ordinary atmospheric conditions where a slight amount of moisture is the only exciting liquid, the galvanic action is very small and the zinc coating, be it ever so light, lasts a long time. In the case of sea water or air saturated with salt moisture, the galvanic action, of course, is much more rapid and a heavier zinc coating is required to resist it for a length of time.

The reason for the protection of iron or steel by a zinc coating is, therefore, on account of the fact that the zinc corrodes at the expense of the iron or steel by the galvanic action set up. Zinc, however, when exposed to the air, does not corrode rapidly or deeply and, in fact, very lightly. This property is of great value as the zinc coating does not corrode rapidly, even with the galvanic action set up, so that it lasts for a far greater length of time than would naturally be expected. The very fact, however, that the zinc corrodes at the expense of the iron is all that is necessary to protect the iron or steel, even though it be extremely slight.

Other metals like lead or tin, on account of their not being electropositive to iron, do not act like zinc. They act simply as a covering like a paint or varnish, and if portions of the iron happen to be exposed, even such as a pinhole, the iron begins to corrode. With a zinc coating, however, this will not take place.

Brass foundry skimmings should first be sifted through a coarse riddle and metal will be obtained that can be used again. The fine material can be sold for copper contents. It does not pay to wash this fine material to obtain the metal in it, as considerable of the fine oxide carrying copper will be washed away.

## The Molding of Bronze Plaques.

Bronze plaques now find considerable sale and are used for both interior and exterior decoration. When well done and colored, they are very attractive, especially the smaller ones that are mounted on an oak panel.

The molding and casting of a bronze plaque is not a difficult matter, when the right method is used, but the majority of brass founders, who are accustomed to ordinary jobbing work, frequently fail to make a satisfactory job of a plaque on account of their lack of knowledge of the manner of molding and casting. This knowledge is easily acquired, however, as the plaque rarely has no undercut portions and only the face needs to be good. The back requires no attention.

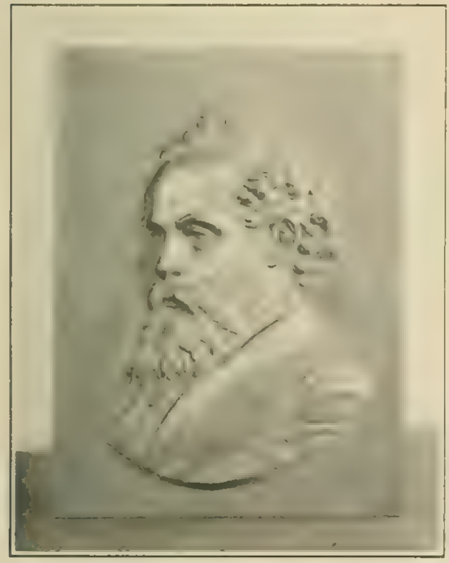


Fig. 1. The Front Side of the Bronze Plaque.

### *The Pattern*

The pattern usually furnished for molding a plaque is of plaster, if only one is required, but if a number are to be made, as they frequently are, a bronze pattern is supplied. In this case the molding is somewhat easier. It is assumed in this article that the pattern is of bronze.

The thickness of the plaque should be sufficient to warrant running the casting without pouring the metal too hot. Nothing is to be gained by using a pattern so thin that the metal will have to be poured very hot in order to run it, as the casting is then apt to be full of dirt. The best results are obtained by having a sufficient thickness so that the metal can be poured rather "dull," and dirt and dross will thus be eliminated from the casting to the fullest possible extent.

If the bronze pattern is new, it should be given a light coating of linseed oil, by rubbing, and then the excess rubbed off as much as possible. This will give a good surface and one to which the sand will not adhere. The pattern is then ready for molding.

### *The Sand*

The production of a fine surface on the bronze plaque depends upon the sand used for molding it. Molding sand used for the ordinary run of brass and bronze castings is altogether too coarse and will not produce a sufficiently smooth surface on the castings. The best sand for the purpose, and one extensively employed for this work is that known as "Windsor-Locks". It comes from the region of Windsor-Locks, Conn., and, for this reason, is given the name which it bears. There are undoubtedly other sands which will give equally as good a surface, but the "Windsor-Locks" is that generally employed.

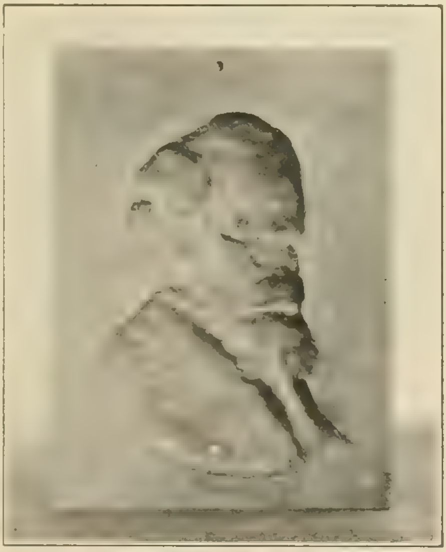


Fig. 2. Back Side of the Plaque.

The "Windsor-Locks" sand is a fine, red sand which is sold by dealers in foundry supplies, ready for use. It is never used for the whole mold, but only for facing, for the reason that it has not sufficient strength for holding itself together for the entire mold.

The mold, with the facing of "Windsor-Locks" sand, is then backed up by ordinary molding sand.

### *Preparing the Sand*

Although the sand comes ready for use, as far as fineness is concerned, and freedom from foreign matter, it is well to riddle it through a riddle in order to take out any stones, sticks or other foreign material that might have accidentally entered the sand. As a large quantity is not used, it can be riddled dry. This operation is not absolutely necessary as it is afterwards riddled during molding.

In order to hold the sand during the subsequent skin-drying of the mold, it is necessary to mix it with some binder. Common-salt is excellent for the purpose and is extensively used. To mix the salt with the sand, it should first be dissolved in water as follows:

Dissolve about two tablespoonfuls of common salt in a pail of water. Be sure it all dissolves. Then wet the "Windsor-Locks" sand with it, in exactly the same manner that ordinary molding sand is wet with water. The only difference being that the water contains a little salt.

The sand should not be very wet, but just enough to moisten it. A good test is to squeeze the sand in the hand and if it takes the imprint of the hand and retains it, then the sand is sufficiently wet. When this point is reached, however, the sand will be comparatively dry. It is a good rule to bear in mind that the sand should be worked as dry as it is possible to work it. If worked too wet the casting will blow and be full of pimples or small depressions.

The object of the common-salt in the sand, as previously remarked, is to prevent the sand from crumbling when the mold is dried. Too much salt is injurious as it will cause red blotches to form on the casting.

### *Molding the Placque*

The placque is always molded with the face down for the reason that dross and dirt always floats upon the surface of the metal and the back of the piece is unimportant. The face is the essential portion, and by casting it in the nowel of the mold, what dross and dirt may enter will be found on the back of the placque.

Place the placque pattern on a mold board with the face up and dust over the surface with lycopodium. This is placed in a cloth bag so that it can readily be dusted on the pattern. Lycopodium cannot be equalled for this work. It allows the pattern to be drawn with great ease and without tearing the sand.

Now place the cope of the flask on the board and riddle the "Windsor-Locks" sand upon the pattern. This sand, it should be borne in mind, is that which has previously been wet with the salt water. A light coating of the sand only is necessary on the surface of the pattern and usually a depth of about a quarter of an inch or less is sufficient. More is not only unnecessary, but will not hold after the mold has been rammed.

After the sand has been riddled on the pattern, take the fingers and ram it well around the pattern and into the crevices. This part, however, would be done with any molding sand and needs no special instruction.

When the facing of "Windsor-Locks" sand has been put on the face of the pattern (it is unnecessary to put it anywhere except on the face of the pattern), the rest of the mold is filled with ordinary molding sand (any good molding sand will answer for this) and the mold rammed up in the usual manner and the sand is scraped off and the mold rolled over. The nowel side of the mold is now finished.

The face of the mold is now dusted over with the lycopodium again and the cope half of the flask placed on. As the back of the mold is now exposed, it would at first appear that it would be unnecessary to face it with the "Windsor-Locks" sand, but it is advisable to do so, otherwise it may come so rough that its appearance will not be satisfactory. It is easy to face the back of the pattern with the "Windsor-Locks" sand and takes but a few minutes. The back will then be as good as the front.

After facing it, fill the mold with the regular molding sand, ram it up, scrape the mold off and then remove the cope. The pattern is then removed and the mold is practically completed.

It is usually found preferable, however, to "cope" the pattern instead of drawing it as there is then less liability of damaging the fine surface of the mold. This can readily be done by rolling the mold over and lifting the top half of the flask off.

The mold can be considered finished, but it is usually considered advisable to "print-back" the pattern again. This "printing-back" is done in the following manner:

The mold is dusted over with the finest charcoal powder by means of a bag, in the same manner that the lycopodium is used. An extremely light coating only is put on. If too much charcoal is allowed to fall on the mold, it will run before the metal and produce imperfections.

When this very light coating of charcoal is put on the mold, the pattern is put back, the cope put on and some more sand put on the top. It is now preferable to "tread" the mold rather than to ram it with hand rammers. This "treading" is accomplished by stamping it down with the feet. The sand is next scraped off from the top of the mold, the cope taken off and the pattern removed. The mold is now ready for skin-drying. This "printing-back" gives the finest kind of impression and is used for the best class of work.

### *Skin-Drying*

The mold is never dried clear through, but is simply dried on the surface. This is the best method for the work and is generally used. To skin dry the mold several methods may be used. The old method was to place the mold with its face towards a stove. This method was in use for many years and a special, square stove, known as a "brass founders' stove" was always employed. This method is still in use, but has been supplanted, to a considerable extent by a gasoline torch. A hot plate may also be employed and, in fact, any convenient method which will dry the face of the mold without burning it.

When the face of the mold is dry, the mold is closed and poured as soon as possible. It is preferable to pour the mold as soon as possible after it has been closed as it is then warm and dry. If allowed to stand for any length of time, it will cool and the face will absorb moisture from the back of the mold. The metal is then poured. In pouring the mold is laid "flat" as it has been found not only necessary to pour it on end, but far better results are obtained by pouring it "flat."

### *Gating*

The method of gating the mold is quite important and an excellent way is shown in Fig. 3. By lengthening the runner as indicated, a pocket is left for the dross which usually flows in with the first portions of metal. The method may be understood from Fig. 3.

### *Pouring*

The heat of the metal used for pouring the plaque is quite important and it should be as low as possible without producing wavy lines in the castings. A molder will have to use his own judgment in the matter, but it can be said that the metal will flow well because the mold is dry. If poured too hot, the surface is not as good and a heat that would do for ordinary composition castings is usually too high.

The metal should be allowed to flow into the mold easily as there is usually plenty of thickness to the pattern so that it will be unnecessary to force it. One or two vents may be necessary on the cope side to take off the gas formed and they should be on the highest portion.

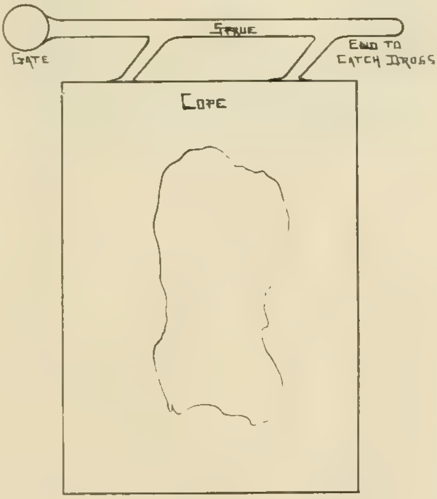


**Fig. 3. Method of Gating the Plaque.**

### *The Metal*

The metal is a very important item in making the plaque. It will be useless to use anything but the best new metal and then it should be of the right mixture. Plenty of tin should be used in the mixture to make it flow readily and the lead should be kept very low to avoid its sweating out on the casting. The following mixture will be found excellent and is known as "Statuary-Bronze." It cannot be excelled for the purpose. There is sufficient tin in it to give it excellent flowing properties, and it will take the finest impression of the mold. The lead is enough so that, in case chasing is to be done on the plaque, it will [illegible] much. The [illegible] is added to give soundness to the metal:

| | |
|---|---|
| Copper | 90 lbs. |
| Tin | 6 lbs. |
| Zinc | 3 lbs. |
| Lead | 1 lb. |

New metals should be used in making the mixture and the best quality. Nothing is gained by attempting to cheapen the mixture as the molding is the most expensive part of the process and by attempting to cheapen the mixture, [illegible] small amount of [illegible] will be saved [illegible] while the whole casting with its cost of molding may be ruined.

### [illegible]

Much depends upon the color of the plaque after it has been finished. When taken from the sand, the gates cut off and the necessary filing and chasing has been done, [illegible] scratch brushed [illegible] with brass wire. This will smooth the surface. The coloring can be done in the following solution:

| | |
|---|---|
| Water | 1 gallon |
| Caustic Potash | [illegible] |
| Liver of Sulphur | 1 [illegible] |

The solution is used hot and in a stone crock or iron kettle. It is unnecessary to have anything but it should be clean. [illegible] take on a light bronze color when it is removed, rinsed in water and then dried. The surface is then scratch brushed to produce an even color. If not even it can be cut back and the operation repeated. The [illegible] should not be allowed to become too dark in the solution as the best results are obtained by taking it out when rather light, hardly more than a stain. The scratch brushing will even up the color. A coat of lacquer is advisable as it protects the bronze surface, but it should be rather thin, just thin enough so that it does not show iridescent colors. If too thick, it does not have a good appearance.

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Vanadium was formerly believed to be the metal with the highest melting point, but recent investigations have shown that it is not and a number of metals exceed it. The melting point of vanadium is 3150° F. while tungsten is 5430°F., tantalum is 5160° F., osmium 4900° F. and titanium 3450° F. Vanadium has about the same melting point as platinum which is 3191° F.

## Gold Trisalyt for Salt Water Gilding.

Salt water gilding has many advantages over the current process and its use is extending. It has the advantage of uniformity of current for the current is generated in the bath itself and is absolutely the same from day to day. No anode is required and the amount of cold deposited is small so that for cheap work it has been found very satisfactory.

One of the drawbacks of the salt water gilding process is that the fulminate of gold is used in making up the solution, and unless one is familiar with its manufacture, the making of the gilding bath is difficult. The fulminate, of course, cannot be allowed to dry as it will explode, and, therefore, its purchase is out of the question. The formula employed by some platers for salt water gilding is as follows:

| | |
|---|---|
| Yellow Prussiate of Potash | 16 oz. |
| Sodium Phosphate | [illegible] |
| Potassium Carbonate | 6 oz. |
| Sodium Sulphite | 4 oz. |
| Sodium Carbonate | 2 [illegible] |
| Gold | 6 pennyweights |
| Water | 1 gallon |

The gold, of course, is "cut" with aqua regia and converted into fulminate.

It has been found by the Roessler & Haaslacher Chemical Co., 100 William St., New York City, manufacturers of the various trisalytes, that their gold trisalyt can be used for salt water gilding with excellent results. When used, it is unnecessary to use fulminate of gold, but simply dissolve the trisalyt in water, together with the necessary conducting salts and the bath is then ready for use.

The following formula has been devised by the Roessler & Haaslacher Chemical Co. for a salt water gilding solution in which Trisalyt is used:

| | |
|---|---|
| Water | 1 gallon |
| Yellow Prussiate of Potash | 6 oz. |
| Sodium Phosphate | 5 oz. |
| Potassium Carbonate | 4 oz. |
| Sodium Sulphite | 3 oz. |
| Sodium Carbonate | 2 oz. |
| Gold Trisalyt | 4 oz. |

The ingredients are dissolved in the water together and the bath is ready for use. Gold trisalyt is a compound of gold cyanide and sodium cyanide.

## Brass Plating Sheet Brass Novelties for Brush-Brass Finish.

It would naturally seem somewhat ridiculous to brass plate sheet brass, but it is frequently desirable when the brush-brass finish is to be given an article. It is often done on sheet metal novelties of the character herewith illustrated.

In making sheet brass novelties soldering is usually necessary to connect some part with another. This practice, of course, leaves a joint which is conspicuous, and if not covered injures the appearance of the article. To brass plate such an article is, therefore, not only desirable but actually necessary, if a high grade product is desired.

Again, sheet brass, unless "low-brass" does not have the best color of the brasses. The so-called "low-brass" which consists of 4 parts of copper and 1 part of zinc, has the desirable greenish-color so much admired, while the ordinary "high-brass" employed for regular sheet brass work and which consists of 2 parts of copper and 1 part of zinc, has a yellow color that is not as pleasing as that of low brass. The difficulty with the use of low brass, however, is that it is considerably more expensive than ordinary high-brass and is not as stiff, so that when worked into articles it is softer.

For these two reasons, accordingly, it is often necessary to brass plate brass novelties. The desired greenish-yellow color can then be obtained, and the soldered joint covered up so that a uniform brass surface is produced which greatly enhances the appearance.

The method of producing the brush-brass finish on such brass plated brass novelties is to remove all scratches and dents, after they have been made, by means of a buff and tripoli. It is unnecessary to "color-buff" them but the tripoli should not be coarse or it will leave scratches on the surface which will require another operation with rouge to remove them.

Now give the article a good brass deposit with the proportion of copper and zinc in the solution at the amount that will produce the green shade to the deposit. A fairly heavy deposit should be given the article as the subsequent treatment with pumice will remove a light deposit and leave the yellow brass underneath.

When the brass deposit has been put on, it is usually necessary to buff the surface so that it will be uniform. This gives a base suitable for the production of the brush-brass finish. It may seem unnecessary to remove scratches or roughness when the surface is again to be scratched, but it is necessary for the reason that for the brush-brass finish, all the scratches must be of the same character. If there are some that are deep and coarse, when fine scratches are desired, then the appearance will be injured. Therefore, it is necessary to have a smooth surface for the application of the brush-brass.

Brass Plated Tray with Brush-Brass Finish.

After the surface has been obtained on the brass, the brush-brass treatment can be given it. This is done by means of a small tampico wheel. One from 3 to 5 inches in diameter will be found suitable and it should not be revolved fast. From 200 to 300 revolutions perminute is good. If allowed to run faster, the pumice and water will be thrown off the wheel and the results are not as good. The best material for producing a fine brush-brass finish is FF pumice. This is mixed with water to a paste and applied to the wheel. The work is held against the wheel and the scratches allowed to run in the same direction.

This grade of pumice produces a very fine surface and one that has proved to be quite attractive. Too coarse pumice produces a more "scratchy" surface which, for novelties is not as attractive.

If the articles are allowed to remain for some time, after the brush-brass finish has been put on, and before lacquering, they frequently stain. This can be removed by running them through a cyanide dip, rinsing, drying and then lacquering as soon as possible. The quality of the lacquer used on the novelties is important and should be of a grade that will not mask the color of the brass.

## Tempered Copper "Comes to the Surface" Again.

Although the tempered copper inventor or "discoverer" does not appear as frequently as in the past, yet he now and then "comes to the surface." This time it is William H. White of Hazelton, Pa., who has patented (U. S. Patent 1,062,067, May 20, 1913) a "Process for Tempering Copper" and who has assigned one-half to Winifred B. White of Hazelton, and one third to Jacob M. Schappert and Margaret M. Schappert of Dorranceton, Pa. He describes his process in a manner that leaves nothing to be desired.

Listen

"Generally speaking, my process comprises three steps: First, heating the copper to the proper temperature, which ordinarily is a red heat, although it may be a white heat (! ! !) where a harder temper is desired in the product. Second, immersing the copper at once into a bath to be hereinafter described in detail and which comprises a hardening ingredient or ingredients, the copper being permitted to remain there until a hissing sound is heard, this being what is known as the blowpoint; and third, laying the copper on a hard surface, preferably a stone, iron or steel plate, striking it a heavy blow with a second hard surface, preferably also a stone, iron or steel plate large enough to cover the piece of copper being treated, and permitting the plate to remain on the copper until the latter turns from red to a golden tint."

The "open season" for tempering the copper seems to be the summer time on account of the vegetable products comprising a portion of the tempering ingredients.

Here it is:

"In preparing the bath, I use proportions which will be indicated in a general way hereinafter, it being understood that these need not be strictly adhered to. I completely slake a peck of lime and then add enough water to make fifteen quarts of the lime water. To this I add fifteen quarts of an infusion from steeping clover, yarrow and burdock. To this I add a quarter of a pound of tallow together with a lump of borax the size of an egg. It will be understood that the volume of the bath may vary, but in a general way the proportions referred to will be found suitable. As I stated above, while I prefer a bath constituted as just described, some of the ingredients may be omitted."

Tempered copper inventors all fail to impart any information about the use of it and do not tell what it is good for when tempered.

## Saving the Zinc as Well as Copper in Brass Refuse.

In the ordinary process of copper smelting, in which brass refuse, such as skimmings, grindings or sweeps are treated, any zinc in the brass is volatilized in the blast furnace and lost. According to a patent recently issued to Harvey M. Murray of Newark, N. J., and assigned to the Metallurgical Research Company of America, it can be saved by treating the refuse in a special manner.

The brass refuse is mixed with fine anthracite coal. A fire is then built on a grate of a suitable converter which, it is stated, may be of the Huntington-Heberlein pot type. The charge of mixed fuel and brass refuse is placed in successive layers in the furnace and is then blown by a suitable air blast. The temperature is such that the zinc is burned out and is obtained in the form of oxide in a bag house or other place of recovery.

At the termination of the operation, there is obtained in the furnace a residue in the form of a copper agglomerate or sinter which can be charged directly into a reverberatory or other refining furnace.

## Extracting Tin from Base Bullion.

A new process for extracting tin from base bullion has recently been patented. The process may be conducted in a crucible or reverberatory furnace. The process is as follows

Common salt is melted in the crucible or in the reverberatory furnace. The bullion is now introduced, when it melts and sinks below the surface of the melted salt. Oxide of lead (litharge) is now thrown on the surface and in a quantity of about twice the amount of tin known to be in the bullion. The heating is continued for about half an hour when the tin will leave the base bullion and enter the slag in the form of oxide of tin.

The slag, which consists of the oxides of lead, tin, with some salt, may be reduced to metal and an alloy of tin and lead produced which may be sold as solder. The process has been patented by Brian C. Besley of Howell, New South Wales, Australia.

## An Improved Electric Cleaner.

A patent has recently been granted to Alfred Levy of Paris, France for a novel electric cleaner, and the same has likewise been assigned to Alexandre Waldberg of the same city. The cleaner is of interest for the reason that it is quite different from anything yet proposed or used. The specification is full of interesting information and the abstract is as follows:

"Electrolytic cleaning solutions as hitherto proposed present two grave difficulties which have prevented their general use in the electroplating industry. The first difficulty is that when the operator is not required to use graphite, which is very expensive, or agglomerated carbon which disintegrates very rapidly, he generally uses an iron anode which has been considered to be insoluble in such electrolyte; this insolubility however is not real, as the iron anode is finally attacked under the action of the current, and the electrolyte is polluted and imperfect iron deposits are produced with the result that the preparation of the articles is interfered with. The second difficulty is, that it is impossible to use such an electrolyte for cleaning soft metals or soldered metals, because the electrolyte in spite of all precautions, attacks the white metals and the articles which are to be cleaned show the presence of a white film which becomes more and more disturbing in subsequent operations, when the quantity of the dissolved white metal is increased. Besides, the presence of white metal in the electrolyte causes the anode to be more quickly attacked with the result that the electrolyte has to be thrown away and replaced by a new one which has again as quickly to be replaced in its turn.

The present invention has for its object to radically remedy the two above mentioned difficulties.

For the purpose of meeting the first difficulty I use in the electrolytic cleaning electrolyte instead of alkaline cyanide, prussiate of potassium (ferro-cyanide or ferri-cyanide) which permits iron, steel, nickel or the like or any alloy of these or similar metals to be used as an anode. It would be even possible to use as anodes a metal which would be attacked by the electrolyte under the influence of the current or not, if the products of such attacks were or would become insoluble in such electrolyte, but I do not recommend the use of a metal which would be so attacked. This electrolyte can be used without inconvenience for the purpose of all metals, except however of soldered metals or white metals.

To meet the second difficulty which presents itself when cleaning soldered or white metals, the above mentioned modification in the electrolyte would not be sufficient. But I obtain the desired result by adding to the electrolyte above described, a certain quantity of chalk; the simultaneous presence of a prussiate and of chalk (excluding any alkaline cyanide) will produce the desired result. As a matter of fact the prussiate which does not itself dissolve the soldered metal, nevertheless, does not prevent the dissolving of this solder by the alkaline body, which is the base of the electrolyte; and the passage of the current in such an electrolyte would lead to a white deposit. But the presence of chalk causes the precipitation of the white metal in the form of insoluble bodies, in proportion as it dissolves in the alkaline body it evidently would not be the same in the presence of an alkaline cyanide, which would dissolve the white metal in order to form a double cyanide, from which the chalk could not precipitate the white metal. The simultaneous employment of a prussiate and chalk (to the exclusion of any alkaline cyanide) is therefore indispensable in order to obtain the desired result. With such an electrolytic cleaning bath, it will be necessary to stir the electrolyte from time to time so as to get the chalk into suspension again, and permit it to accomplish its work during the course of the operation. When it is a question of cleaning articles made of a metal which can be employed as the anode in such a bath, such as iron, for example, one could, of course, use these articles successively as anodes and cathodes, by reversing the direction of the current; and this would permit of the work being accomplished more rapidly. One might even if one is using certain definite anodes, as stated above, usefully have recourse in certain cases to reversing the current. It is superfluous to state that with an electrolyte thus modified, one can employ anodes of graphite or of carbon, if one does not fear the objections attached to their use and referred to above.

The quantity of chalk to be employed may be very variable and, in case of need, a fresh quantity may be added to the bath after it has already been in operation. By way of example I may state that a weight of chalk equal to one-tenth of the weight of the alkaline body which is the base of the electrolyte will be sufficient, but I do not bind myself to these proportions.

The following is the formula of a bath which gives excellent results:

| | | |
|---|---|---|
| Water | 1 | gallon |
| Caustic Potash | 12 | oz. |
| Yellow Prussiate of Potash | 1¼ | oz. |
| Chalk | 1 [illegible] | |

The chalk should be used in a finely powdered condition."

## Rust-Proofing Iron or Steel by Copper and Nickel Plating.

While zinc, of course, is the best rust preventive for iron or steel, its appearance prevents its use for many purposes. Resort is had to copper plating or nickel plating and these frequently fail to come up to the requirements. They fail for this reason: In the case of copper plating, a cyanide of copper solution is generally used and this fails to deposit the required thickness of metal. In the case of nickel, a deposit too thick, so that it acts as a sufficient coating for preventing rust, is apt to peel or flake. The ordinary copper or nickel deposits, therefore, fail to come up to the requirements.

This difficulty may be overcome by a very simple and satisfactory method and one that is rarely appreciated, although carried out by some manufacturers. It is accomplished by first giving the iron or steel a coating of copper in a cyanide copper solution, then giving it a heavy copper deposit in an acid copper solution, and afterwards nickel plating. The heavy acid copper deposit is the one which gives the protection as it is possible, by its use, to obtain almost any desired thickness and quite rapidly. The various steps of the process are as follows:

The iron or steel article is prepared, by polishing, if necessary, and then freed from grease. It is then given a good deposit of copper in a cyanide copper solution. The use of this cyanide copper solution is absolutely necessary as a preliminary operation for the reason that it is impossible to plate the iron or steel directly in the acid copper solution. The cyanide copper solution can be used cold, if desired, but far better results are obtained, and much more rapidly, if the solution is used hot, say at about 150° F. In the use of a hot solution of this kind, it should be weak and not stand over 5° Beaumé. It then deposits copper rapidly, of an excellent color and which adheres tenaciously. It also "throws" into pockets and crevices better than a cold solution.

As soon as the iron or steel is covered well, no further deposition of the copper in the cyanide copper solution will be necessary. No bare places should be preseent on the surface, but every part covered.

The next step is to give the article a heavy deposit in the acid copper solution. This solution should be made as follows:

| | | |
|---|---|---|
| Water | 1 | gallon |
| Sulphuric Acid | 4 | oz. (fluid) |
| Sulphate of Copper | 1¾ | lbs. |

This solution is used cold and will stand about 20° Beaumé. A much weaker current is used than with the cyanide copper and from 1 to 2 volts are employed. If the copper deposit becomes dark red on the edges, while the remainder is bright red, it indicates that the current is too strong and it should be cut down.

The article is given a deposit of from 1 to 1½ hours duration in the acid copper solution or until a heavy coating has been obtained. It will then be slightly rough, as heavy deposits are usually in this condition.

The next operation is to cut down the surface for the copper deposit and it is best done by means of a hard buff wheel and tripoli. When a smooth surface is obtained, which is an easy matter on account of the softness of the copper, it is cleaned from grease and then given a nickel deposit. This deposit should be as heavy as consistent as it will then supplement the acid copper deposit as a rust-proof coating.

By the use of this intermediate copper deposit from the acid copper solution, it will be found that iron or steel can be made quite rust proof. The copper coating is soft and will not peel or strip if the cyanide copper deposit has been put on in a satisfactory manner.

---

Many platers make a mistake in not using their electrogalvanizing solutions sufficiently strong. This is particularly true in the case of work upon which the deposit of zinc must "throw" into deep portions. The best results are obtained when it is nearly saturated with zinc sulphate.

## Use of Phosphorus in Soft Solder.

According to John T. Dwyer of St. Louis, Mo., phosphorus is beneficial in soft solder. It has the following advantages, the inventor says:

1. It allows a cheaper mixture to be used.
2. It causes the solder to flow more freely.

The solder herein described has been patented by the above inventor (U. S. Patent, 1,059,982, Apr. 29, 1913), and he states that by its use, from four to five cents a pound can be saved on the mixture and yet have a solder that will give equally as good results.

The mixture used is as follows:

| | |
|---|---|
| Tin | 41.50% |
| Lead | 56.48% |
| Antimony | 2.00% |
| Phosphorus | 0.02% |

The method of making the solder, recommended by the inventor, is first to melt the lead in an iron kettle and then add the tin and antimony to it, stirring thoroughly to mix the whole. The phosphorus is next introduced by means of a phosphorizer or other suitable means. Ordinary yellow phosphorus may be used, but better still is phosphor-tin which eliminates the danger attending the use of phosphorus. If phosphor-tin is used, then the preceding formula should be slightly altered and the following proportions taken:

| | |
|---|---|
| Tin | 41.12% |
| Lead | 56.48% |
| Antimony | 2.% |
| 5% Phosphor-Tin | 0.40% |

The phosphor-tin may be introduced last, after the other metals have been melted.

---

Caesium has the lowest melting point of any metal that is solid at ordinary temperature. Its melting point is 79° F. which, it will be appreciated, is attained in a warm room or during the summer months.

---

Dross may be partially prevented in hot galvanizing, by a uniform heating of the kettle containing the molten zinc. The hotter the iron of the kettle, the more rapidly the zinc alloys with it forming zinc dross. It is frequently the case that the bottom of the kettle is heated far beyond what it should be during the galvanizing and the quantity of dross is thus greatly increased.

## Re-Plating Old Silver-Plated Flat-Ware.

One of the jobs which the early custom platers were called upon to do was the refinishing of old silver plated flat-ware. In those days, nickel plating had not come in, brass plating was never done; and, in fact, the electroplating was confined to silver and gold plating, and this principally of flat-ware. What other metal goods were used in the household were of solid brass or pewter so that job platers were rarely called upon to do anything but silver plating.

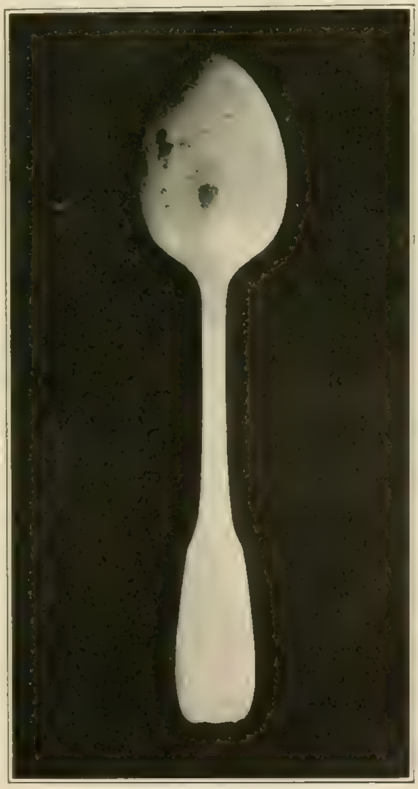


Fig. 1. Flat-Ware as Received for Re-Plating.

Conditions have now almost been reversed and flat-ware is not re-plated as much as formerly for the reason that it may be purchased so cheaply. In country districts, however, it is still done to a large extent and many a jobbing plater earns a good living by it. In cities, too, hotels and restaurants have considerable work for replating. As a matter of fact, hollow-ware is more frequently a greater source of profit for the jobbing plater than flat ware as its initial cost is higher, but with the best grades of flat ware, upon good 18% German silver base, it is usually economical to have them replated if too much labor is not spent upon them so that the cost is brought too high and the customer finds that he has paid nearly as much for refinishing as new ones can be purchased for. Platers should be careful about making too great a charge for replating flat ware, as it can be replated so that the customer will be satisfied and a good profit can be made upon it.

Practically all flat-ware is now silver plated upon German silver. Steel is never used for spoons, and very rarely for forks. The cheapest class of flat-ware, has brass for the base metal but such goods are unreliable and have a very cheap appearance. Their use is confined mostly for gift goods and those sold at a very low figure. It is very seldom that such goods are brought in to the jobbing plater for refinishing, and if they are, he should advise purchasing new ones rather than replate them. There is very little silver on them. The brass is first nickel plated and then silver plated with a bright silver deposit.

The great majority of flat ware is upon a German-silver base. The best grades are always made of 18% German silver (18% nickel) while cheaper grades are composed of lower nickel percentages. Some are made of 15% or 16% German-silver and others of 12% or 10% grades. The latter, however, are the cheapest grades of flat-ware except those on a brass base. The flat-ware which the jobbing plater is called upon to refinish, however, is composed of either low or high grade German-silver, but the method of treating it is the same and it will not matter what the percentage of nickel is in it. That with a brass base, too, will be plated in the same manner should he be called upon to do it.

The cost of re-finishing flat-ware will depend upon the character of the job that is done upon it. There are really two kinds of jobs that can be done and upon them depends the cost of the refinishing. They are as follows:

1. The best character of work. This necessitates the stripping of the silver from the flat-ware, polishing, silver plating, scratch-brushing and buffing or burnishing. The work will then be practically equal to new.

2. A cheap grade of work. This involves a simple buffing, to remove some of the scratches, silver plating over the old silver without removing it, and then buffing. The process is really nothing but "whitening", but answers for cheap work and is oftener done than any other. The flat ware looks pretty well and the customer is usually satisfied, particularly with the price.

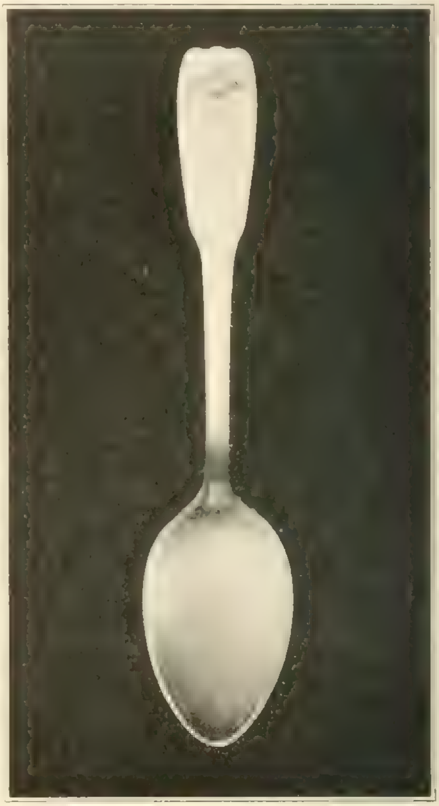


Fig. 2. As Finished.

### *The Best Grade of Refinishing*

The average lot of flat-ware brought to the job plater for refinishing is dented and scratched and the silver is worn off the bottom of the bowl and handle. To do the best job, the silver must first be stripped. To do this, proceed as follows:

Run the flat-ware through the potash or lye kettle for removing the grease and brush out the background of any figured pattern to remove any dirt lodged in it. Rinse in cold water, then in hot water and dry off. The goods are now ready for stripping. The strip for removing the silver is made as follows:

| | |
|---|---|
| Sulphuric Acid | 1 gallon |
| Nitric Acid | 4 oz. |

Pour the nitric acid in the stone-crock to be used and then the sulphuric acid into it. Stir well and it is ready for use. The flat-ware, cleaned from grease and *dry* is hung in it until the silver is removed. The pieces should not touch one another. If the strip works too slowly, a little more nitric acid can be used, or the whole warmed. It is preferable, however, to allow the strip to work slowly with the amount of nitric acid given in the formula as the action is then even and there is no pitting. It may take an hour or two if there is much silver on the flat-ware, but it is very easy to ascertain by the appearance when all the silver is removed by the appearance of the flat-ware. It will have a dark gray appearance and the silver is white.

When all the silver has been stripped off, remove the flat-ware, rinse in water and dry. It will be found that the German-silver from which the silver has been stripped has a dark gray appearance and is seemingly rough, but will be found smooth, with the exception of the dents and scratches.

The strip can be used almost indefinitely and finally the silver may be recovered from it as follows:

For every gallon of strip take, in a separate stone crock 5 gallons of water and add to it and dissolve, 1 lb. of common salt. Now pour the strip *into* this salt solution, stirring all the time with a wood stick. The solution will become hot, but this will not matter. If too hot, then wait for it to cool before all of the acid has been added. The silver will be precipitated as chloride. Allow to settle and test the clear solution with a little salt solution, to see if all the silver has been thrown down. If not, add more salt solution, stir and allow to settle again.

Pour or siphon off the clear solution and throw away. Add clear water, preferably hot to the crock, stir and allow to settle. Pour off clear liquid again and add clean, clear water and repeat the operation. This should be done four or five times until all the acid is washed out of the chloride of silver in the bottom. The chloride thus obtained can be filtered out and saved for use in making silver solutions.

The flat-ware, from which the silver has been removed, is now treated for the removal of the dents and scratches. This is done by buffing with tripoli on a hard buff. It usually is not a hard job to remove them as they are generally on the places most exposed to wear and these are the ones which may easily be touched to the wheel. Frequently the bottom of the bowl and handle are all that are required to be treated. The rest of the surface, from which the silver has been stripped, will need no polishing.

Now run the goods through the cleaning kettle to remove the buffing dirt, and brush out any that may be in the backgoround of figured work.

The next operation is the "quick-dip" or coating the surface with a slight film of mercury in order to hold the silver on more firmly. This dip is made as follows:

| | |
|---|---|
| Water | 1 gallon |
| Cyanide | 4 oz. |
| Corrosive Sublimate | 1/8 oz. |

The dip is used cold and the flat-ware immersed in it only for a second. It should give only a bluish film of mercury and is, for this reason, frequently called the "blue-dip." If the flat-ware becomes coated with a film of bright mercury, it shows that it has either been left too long in the dip or there is too much mercury in the solution.

The flat-ware, dipped *momentarily* in the "quick-dip" is rinsed in cold water and is ready for the strike. This is made as follows:

| | |
|---|---|
| Water | 1 gallon |
| Cyanide | 8 oz. |
| Silver | 1/2 oz. |

The silver is converted into chloride in the usual manner and dissolved in the cyanide.

The flat-ware is now given a coating of silver in this "strike" and with a stronger current than is employed for regular silver plating. As soon as the flat-ware has been covered all over it is removed and at once transferred to the regular silver-plating bath made as follows:

| | |
|---|---|
| Water | 1 gallon |
| Cyanide | 8 oz. |
| Silver | 3 oz. |

Convert the silver into chloride in the usual manner and dissolve in the cyanide. If it is found that the anodes coat over while the plating is going on, it indicates that a little more free cyanide is necessary, and more can be introduced.

Now plate the flat-ware, just taken from the "strike" in this solution with a current of 1 volt until the right amount of silver is put on. Just how long to plate it will be determined by the plater and will depend whether a heavy or light silver deposit is to be used. For a heavy plate, run for an hour, but a light plate can be put on in about fifteen or twenty minutes. The plater can, therefore, use his own judgment about the amount of silver to be put on.

The silver plating done, the flat-ware is rinsed, and then scratched-brushed on a brass wheel, after which the surface is buffed with soft rouge. It can be burnished, if desired, but this is expensive and laborious and is rarely done in the jobbing trade. Buffing is equally as good for this class of work and costs very much less.

### *Cheapest Method of Refinishing*

It is frequently necessary to do a very cheap class of work in refinishing the flat-ware. This can be done without stripping and, as said before, amounts to a whitening and buffing. The dents and scratches are buffed out as much as possible and the flat-ware cleaned and scoured with pumice. If the dents are not bad and there are few scratches, some platers do not take them out but plate right over them.

After scouring and cleaning from grease, run through the "quick dip", then through the strike and finally deposit the desired amount of silver in the silver plating solution. Then scratch-brush and buff.

Silver, unlike nickel, can be plated over and the deposit will adhere. It is always preferable, however, to buff off the scratches and dents before doing anything as this does not take long and the final appearance of the work is then greatly improved.

### *Troubles*

The usual trouble of job platers is the production of a hard silver deposit. This will be found rough and to require "cutting down" with tripoli. The ordinary soft rouge on a rag buff will not touch it. Such a silver deposit is not at all good. It is caused by the use of too strong a current. If the current is kept down to 1 volt or less, it will not be difficult to obtain a soft deposit. A good silver deposit will be dead, but feel smooth. It responds readily to the scratch brush, which the hard silver does not. If it is impossible to cut the current down, the addition of water to the solution will usually remedy the trouble as many silver solutions become too concentrated on account of lack of attention and evaporation.

## Correspondence.

### Whiteness of German-Silver for Flat-Ware.

*Editor:*

We wish to take exception to the statement made in an article on the use of German-silver in the manufacture of flat ware and appearing in the March issue of THE BRASS WORLD, page 78. This article also appeared later in the *Jeweler's Circular Weekly.*

You state in this article that 18% German-silver is the best quality for silver plated flat-ware and that it has the whitest color of any of the German-silver alloys. We must differ with both of these statements. True 18% German-silver makes a good base metal for flat ware, but 21% is better and whiter, and our company has always used this 21% mixture in our best grade of flat-ware.

The first expense is greater, and it is a little more difficult and expensive to finish, but the finished articles are well worth the difference and more.

*Wm. A. Rogers, Ltd.*
*W. A. Carason, Supt.*

*Niagara Falls, N. Y.*
*May 10th, 1909.*

Salt-water gilding is now coming into extensive use as it has been found very serviceable for cheap work. It gives very uniform results as far as color is concerned and requires no particular skill to manipulate it.

Boracic acid has great value in a nickel plating solution and not only gives the nickel deposit a bright and clean appearance, but stops pitting to a great degree. One of the great advantages of boracic acid is that an excess does no harm as it separates out in the solution in a moss-like condition. Only about 5 oz. can be dissolved in each gallon of nickel plating solution.

## Nickel Plating Solutions for Plating Barrels.

The conditions which exist in a plating barrel are somewhat different from those which are found in "still" plating such as basket, rack or strung work. The difference is that there is a much greater resistance offered to the passage of the electric current. Were it not for this fact, the plating operation would be identical with "still" plating. The interposing of the sides or staves of the barrel between the anodes and the work being plated is the cause of this high resistance, comparatively speaking, which is found in plating barrels. To overcome it, currents of high voltage are used and from 10 to 12 volts are often employed for the purpose, when for "still" solutions less than 6 volts would be employed. The use of this high voltage, however, will only partially overcome the difficulty if the solution is not right, and if it is weak and low in metal, only a very light deposit will be obtained on the work in the plating barrel. *To obtain the best results in a plating barrel, the plating solution should be as strong as possible or practically saturated.*

For a nickel plating solution for plating barrel work, as much nickel salts as the water will take up should be used, together with conducting salts. The object is to render the solution as good a conductor as possible. The following will be found satisfactory for this work:

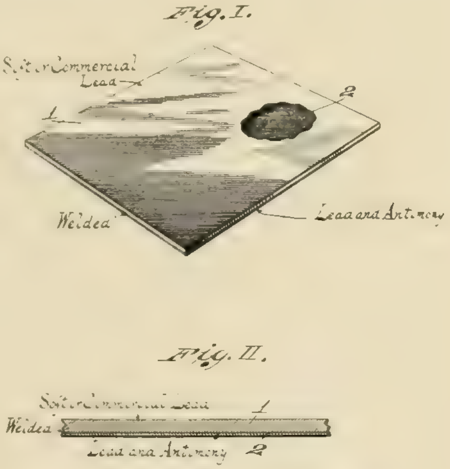
| | |
|---|---|
| Water .................. | 1 gallon |
| Double Nickel Salts ...... | 12 oz. |
| Single Nickel Salts ....... | 2 oz. |
| Sal-Ammoniac ........... | 2 oz. |
| Boracic Acid ............. | 2 oz. |

This solution will stand from 9 to 10 degrees Beaumé. In its use, plenty of anodes should be used for the reason that the nickel is deposited rapidly during barrel plating, and unless there are plenty of anodes to supply it, the solution becomes weak in metal and quite acid so that the nickel is deposited quite slowly and the work will receive a light coating.

The boracic acid will not dissolve in a cold solution, but must be boiled in. All of the solution need not be heated for this purpose, but a small portion can be used and the boracic acid boiled in it. This small quantity is then added to the main solution while hot.

## A New Compound Metal for Lead Lined Tanks.

For holding sulphuric acid, used in pickling and other operations, lead lined tanks are extensively used. The lead lining, however, unless very thick frequently buckles and injures the tank. Edward R. Hoyt of the Hoyt Metal Co. of St. Louis, Mo., has recently patented a compound lead sheet for this purpose which appears to have special advantages.



Sketch Illustrating the Manner of Making the Sheet.

The sheet is composed of an outside and thick layer of lead (pure) and a backing of an alloy of lead and antimony. The alloy of lead and antimony is made of a separate mixture and then welded to the pure lead, thus making a compound ingot. The ingot or slab is then rolled. In this manner a compound sheet is obtained, with a soft face and a harder lead alloy backing. It is then capable of holding its shape better than an ordinary soft lead sheet.

The backing of the alloy or lead and antimony, according to the patent, may contain from 2 to 20 per-cent of antimony. The sheet is intended for use in lining chemical tanks.

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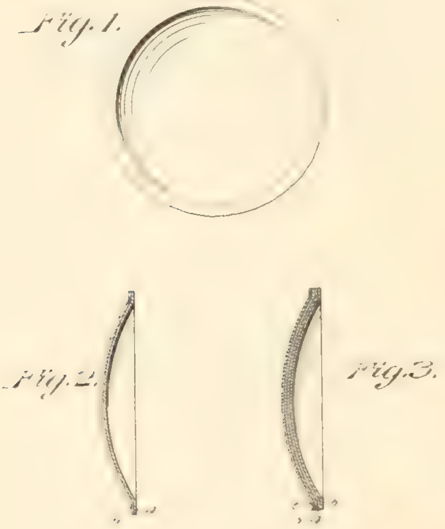
The black slime which is found on silver anodes are the impurities in the silver which are insoluble in cyanide. Lead, arsenic, antimony, tellurium, selenium are frequently found in the slime.

## A Novel Process of Manufacturing Silver Plated Goods.

A new and novel process of manufacturing silver plated goods has been patented by David G. Rea of Providence, R. I., and assigned to Theodore W. Foster & Bro. Company of the same city, manufacturers of silver goods.

The object of the invention is to protect the silver of an article being manufactured from the heat caused during the soldering, and also from injury caused by the handling of the goods during the process of manufacture.



Method of Making the Goods.

The process, while it may be applied to other metals, is intended particularly, for use in the manufacture of sterling silver goods and the article herewith illustrated is supposed to represent this kind of metal.

Fig. 1 is a blank after it has been shaped. Fig. 2 is a section of the blank showing the layer of silver and the supporting layer of base metal; while Fig. 3 shows a section of a blank with the layer of silver, the supporting layer of base metal, and the protecting layers.

The method of carrying out the process is as follows: The article is first formed in the rough, after which it is nickel plated. The final finishing is then given the article during which operation hinges, catches or other parts may be soldered on. The article, with its nickel deposits, is then subjected to a stripping solution and the nickel removed by means of the electric current. The silver underneath is then polished and buffed for the final finishing. The silver will now be found free from scratches and other imperfections which are apt to occur in the ordinary process of manufacture.

## A German Process for Soldering Gold Chain-Links.

A new process for soldering the links of gold chains has been patented by L. F. Britsch of Pforzheim, Germany. The process is intended for preventing the chains from becoming stiff, during the soldering, on account of the solder overflowing at the hanging point between two links. The inventor states that previous processes such as coating the links with a solder-resisting material, or the use of a shaking device, are quite unsatisfactory and unreliable as they consume much time and cannot be depended upon.

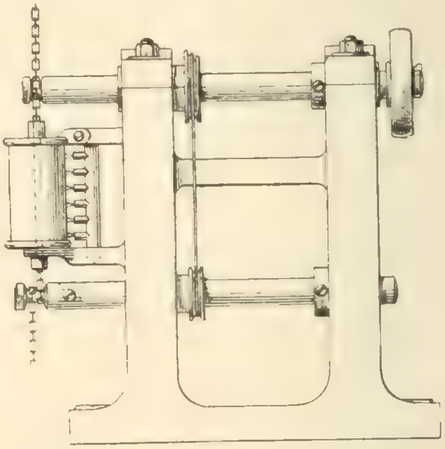


Fig. 1. The Machine Used for Making the Chain.

The present process makes use of a special apparatus, herewith shown, for soldering the links. In soldering the links it is assumed that the chain is made of cored wire as it is not adapted for other kinds of chains. This kind of wire consists of an outer covering of gold or gold alloy (or rolled plate) and a core of solder.

The novelty lies in the manner of guiding the chain over a shaft, both before soldering and afterwards. This method may be understood from Fig. 1. The chain passes over a shaft or "roller-head" and then to the soldering chamber, after which it is again passed over a second shaft. It is the use of this guiding shaft that constitutes the principal feature of the process. The movement of the chain over the shaft, over soldering, prevents the solder from adhering to any other part except the joint. The continuous movement causes the links to move constantly and thus prevents the adhesion of the solder to any portion except at the actual joint, as at this point there is no movement and the solder does not separate at its moment of cooling.

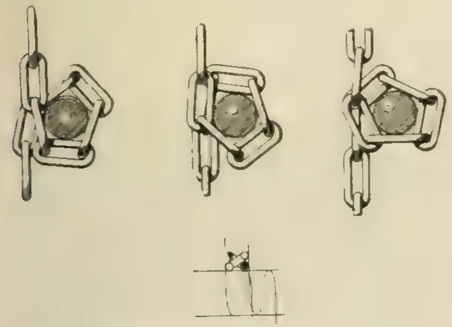


Fig. 2. Showing How Chain Passes Over the Mandrel.

## A New Method of Coating Iron or Steel with Copper by the Hot Method.

A new method of coating iron or steel with copper by the hot process has been patented by William G. Clark of London, England. The process, it is stated, is particularly applicable for coating thin sheets.

The iron or steel, previously cleaned from scale and rust, is immersed in a solution of copper until a coating of copper is obtained*. This is then coated with a mixture of equal parts of borax, boracic acid and carbonate of soda. Either one may be used, the inventor states, but the mixture is preferable. The sheet now coated with this flux is heated in a furnace until the copper melts when it unites with the iron or steel, while the flux prevents it from oxidizing. The flux is then removed by soaking in hot water when a copper coated iron or steel plate or sheet is produced.

The inventor states that this is preferable to the method of dipping the iron or steel in melted copper, as the latter process forms a hard alloy at the union of the two metals which deteriorates the base.

## A New Use for Metallic Cobalt.

Cobalt has, heretofore, not found any extensive use. Its oxide is used in glass coloring and pottery coloring and decoration and a small quantity is used in special alloys. There is, however, no extensive use for the metal. It very closely resembles nickel in its properties except that it seems to harden an alloy containing it to a greater extent.

It would appear from the following recent article in the *Ironmonger* that cobalt may possibly have an extensive use in steel. The following remarks are made as regards its use in the steel industry in England:

"Steel experts in Sheffield are experimenting with a new grade of high-speed steel, in which a small proportion of cobalt is introduced in addition to tungsten, vanadium, and other customary ingredients. It is said that the effect of the cobalt is to intensify the characteristic qualities of tungsten and vanadium steels, and that it imparts to the tools increased speed and durability. Cobalt steel is being already made in America and Germany, and some of it has been offered in this country at extremely high prices. The Sheffield steel-makers are proceeding with their usual caution and do not intend to offer the new steel to the engineering world until the fullest experiments have demonstrated beyond doubt its permanent commercial value and the particular purposes to which it may be advantageously applied. A small quantity of the material has, however, been made in Sheffield, and some manufacturers there have been asked to supply it. Cobalt is found in Ontario, and the present supply is limited, but there is plenty of ore which could be profitably mined if a larger and regular demand arose for it. The current price is from 500*l.* to 600*l.* per ton. Cobalt steel will be more expensive than the best vanadium steels, and in Sheffield it is not thought that it will supersede the present high-speed steels to any considerable extent, although it will probably be advantageous for various purposes. Experiments in adding cobalt to carbon steel mixtures are being made.

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*It would seem that it would be preferable to deposit copper on the surface by electrodeposition, although this is not mentioned in the patent.—*Editor.*

## New "Keystone" Electrical Measuring Instruments.

Some new types of electrical measuring instruments have recently been placed on the market by the Keystone Electrical Instrument Co. of Philadelphia, Pa., the well-known manufacturers of electrical measuring instruments These are called the "Midget" types and comprise ammeters and voltmeters for use on switchboards, dashboards and for portable use. Where a small instrument is desired they will be found particularly serviceable.

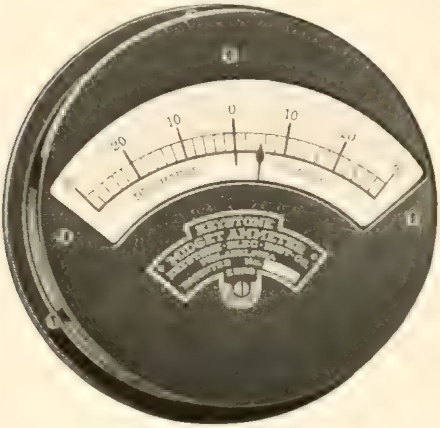

Fig. 1. Front of the Instrument.

The endeavor has been, in constructing these instruments, to reduce the number of parts required in the standard d'Arsonval system to a minimum as it is a well known known fact that this type of measuring instrument is the most accurate type for direct currents. In order to reduce the cost of these small instruments, and at the same time produce a high grade instrument with accuracy, this company has given the matter much study with the result that these new types have been constructed.

Fig. 1 shows the front of the ammeter. A tungsten steel magnet of unusually large size is used in it so as to insure permanency and to secure the dead beat operation of the instrument. No pole pieces are used on the magnet as the ends are accurately ground, thus doing away with the joint between the magnet and the pole pieces. The bases are of molded material so as to insulate the studs carrying the current through the switchboard. To obtain the greatest strength from the magnets, the covers are formed of brass instead of iron. All holes are square instead of round so that there is no danger of turning when the parts are tightened. The fine aluminum wire coil swings on sapphire jewels between the poles of the magnets. The pointer is of fine aluminum tubing and with a moving element so light as this the instrument is absolutely dead beat

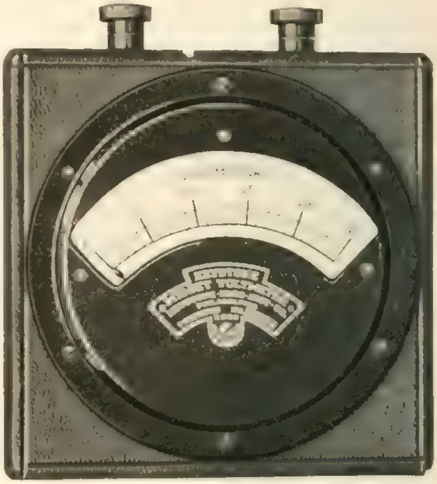

Fig. 2. A Portable Instrument.

The light weight of the moving parts puts practically no weight at all on the bearings and thus the life of the instrument is insured at its maximum. The whole weight of the moving part will not exceed 1/10 of a gram. The scale is white enamel on brass except where desired, when white letters with a black background can be supplied. Each instrument is supplied with a zero adjusting device, by means of which the pointer can be adjusted to zero from the outside of the case. In Fig. 2 is shown the type of portable instrument manufactured by the company.

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In the use of hot plating solutions, it should be borne in mind that too high a heat is detrimental. They should never actually boil or even approach it. From 120° F. to 150° F. is a suitable temperature

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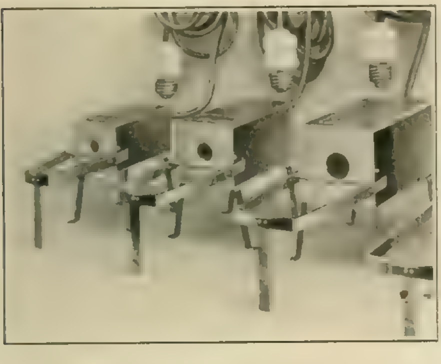
For plating barrel work, plating solutions should be made as strong as possible so as to render them as good a conductor as can be obtained. Such plating solutions, therefore, are used in practically a saturated condition.

## Electric Furnaces for Heating Soldering-Irons.

A new line of electric furnaces for heating soldering-irons has recently been placed on the market by The Bristol Company of Waterbury, Conn. The furnaces are wound for either 110 or 220 volts direct current and will maintain a uniform temperature inside of the furnace, suitable for heating the copper to the necessary degree.



Electric Soldering-Iron Heaters.

The winding is so proportioned that the temperature is highest near the inner end of the heating chamber. If, however, it is desired to have the copper particularly hot, it is pushed to the full depth of the oven, and if a medium hot copper is desired, it is partially withdrawn.

These furnaces are made in a number of different sizes and are made with a fused quartz lining which withstands the heat without cracking. The resistance wire used in them is a special alloy made particularly for standing the high temperature necessary. The furnaces are quite expensive.

## A New Process for Coating Metals With Tin or With Lead.

A new process for coating iron, steel or other metals with tin or lead has been patented by Fritz Plathner and Victor Dorn of Berlin, Germany. The process is quite simple and needs no special appliances.

The article to be tinned is first cleaned from rust, scale and grease and then treated in the following manner:

*For Tinning*

A mixture of 2 lbs. of tin powder* and 1 lb. of powdered chloride of zinc is mixed in a paste with water or alcohol and this paste is then spread on the surface to be tinned. The surface is then heated by any convenient means until the tin melts, when it will be found that the surface has become coated with an adherent layer of tin.

*For Coating with Lead*

For coating metals with lead the previous method is used except that powdered lead* is substituted for the tin. The article is heated until the lead melts and the surface will then become coated.

It is stated by the inventors that sal-ammoniac may be used in place of the chloride of zinc if desired.

## Use of Titanium in the Non-Ferrous Metals.

In a paper read recently before the Cleveland Meeting of the *American Institute of Mining Engineers* and entitled "Notes on Titanium", Bradley Stoughton made the following remarks on the use of titanium in the non-ferrous metals:

Titanium hardens and strengthens aluminum and increases its toughness and resiliency. It is stated that the addition of titanium, chromium, and copper to aluminum gives some of the hardest and toughest light alloys yet produced. Some years ago, small percentages of titanium were added to aluminum to make an alloy which was used by European bicycle manufacturers; the strength of the aluminum was increased from 23,300 to 73,500 lb. per sq. in. Richards states that titanium has been alloyed with aluminum in proportions up to 7 per cent., but that 2 per cent. gave the best result. This alloy had an elasticity comparable to spring-brass, but it corroded badly, and so has disappeared from the industrial world. Copper is greatly improved by the addition of titanium in small amounts to remove oxygen and gases, and this is a branch of the industry which is now undergoing rapid development.

Chromium and iron have practically the same melting point. That of chromium is 2750° F. while that of iron is 2768° F.

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*Tin and lead powders are now commercial articles.

# Questions and Answers.

Question No. 1306. Will boracic acid stop the pitting of nickel deposits?

*Answer.* It very often will, if there is sufficient nickel in the solution. A nickel solution, however, that has become exhausted of its nickel will not be altered by it. Ordinary cases of pitting, however, will be stopped by the use of boracic acid.

Question No. 1305. We are making highly ornamental bronze and brass castings which are used in bank railing work; and while we are making castings superior to anything in Canada, we find they are not nearly as smooth as those produced in New York. We are using the best Windsor-Locks sand and the molds are skin-dried and then smoked. The mixture we are using is as follows:

| | |
|---|---|
| Copper | 90 lbs. |
| Zinc | 10 lbs. |

This is practically the same mixture as the rod bronze we use and which we obtain from rolling mills. We would state that the cost of the castings is not important as finishing by hand sometimes brings the cost to $2.00 per pound. Kindly help us out in this matter and oblige.

*Answer.* The whole difficulty is in the mixture you are using. While it is suitable for making rods or sheet, it is not good for castings as it contains no tin. Tin is necessary to make the castings run sharp and it also enables them to be poured at a comparatively low heat and thus clean work is obtained. You will have to use considerable tin in the mixture and it is also good policy to use less zinc as the castings will then come cleaner. A mixture used for bronze statues is excellent and cannot be equalled for your work. The conditions are almost the same as both cases require sharp, clean work. Use the following and you will not have any difficulty. Your molding methods are all right:

| | |
|---|---|
| Copper | 90 lbs. |
| Tin | 6 lbs. |
| Zinc | 3 lbs. |
| Lead | 1 lb. |

Question No. 1307. We are desirous of making our manganese-bronze a little stiffer. How can it be done without affecting the strength?

*Answer.* You can stiffen your manganese-bronze by adding more tin to it. The quantity added must be small, however, or you will cause it to become brittle. We should not increase the amount by over half a pound of tin to 100 lbs. of the bronze. This may be found too much, and if so you can add less. We do not know how much you are now using, but you can easily find the right quantity by a trial.

Question No. 1308. Can automobile head lights be plated without removing the glass reflectors. We have tried it and the cyanide plating solution takes the silvering off the glass.

*Answer.* You will not be able to plate the lamps without removing the glass reflector. This is easily taken out by means of screws and you can then replace it when the lamp is finished.

Question No. 1309. A lot of pigged brass is on our hands which analyzes as follows:

| | |
|---|---|
| Copper | 67.00% |
| Zinc | 29.90% |
| Tin | 1.50% |
| Lead | 0.60% |
| Iron | 1.00% |

We desire to know if the iron occurs throughout the brass as free iron or alloyed with the other metals. The brass came from a machine shop in the form of drillings and was run through the magnetic separator, melted and pigged. If the iron is alloyed with the other metals, the brass can be converted in a low grade manganese-bronze.

*Answer.* The analysis will not tell whether the iron is combined or free. An iron chip might be imbedded in the brass and the drill would take it out. If this was included in the analysis, it would show an abnormal percentage of iron. The only method of ascertaining whether the iron is combined or free, is to make two separate analyses from different portions of the pig, and if they agree on the iron, then it is combined. Combined iron does not injure brass except to make it slightly harder. While brass containing 1 per-cent of iron is slightly harder than brass free from it, it can machined readily. You can, of course, put it into a low grade manganese-bronze as you mention.

Question No. 1310. Is there any agent, except potassium cyanide used as a conducting agent in silver plating solutions?

*Answer.* As far as known, there is no conducting agent used in silver plating solutions. It is unnecessary. Potassium cyanide is an excellent conductor and, therefore, nothing else is needed. This is indicated by the fact that silver plating can be accomplished with such a low voltage which, under regular conditions, can be done with 1 volt.

Question No. 1311. We have been making carburetors for gasoline engines by our die castings process. These have been made from alloys very high in tin, as those containing a high percentage of zinc corrode under the influence of gasoline. We have not been successful in copper plating these castings, and we have been informed that there has lately been placed on the market a certain chemical which will assist the copper in eating its way into the zinc, thereby impregnating itself which would, we believe, render the zinc metal capable of resisting gasoline. Can you give us any information about this matter?

*Answer.* We have never heard of the

chemical you mention and doubt very much whether it can be done. You can copper plate the carburetors if you use a hot cyanide copper solution according to the directions given in THE BRASS WORLD, April 1913, page 123. Then give them, after they have been plated in the cyanide copper solution, a heavy deposit in an acid copper solution and you will have a deposit which will resist the action of the gasoline.

Question No. 1312. We have heard that zinc dross can be used for making a cheap grade of manganese-bronze? Is this correct and what is the manner of making it with the dross?

*Answer.* Zinc-dross can be used for making a cheap grade of manganese-bronze, but cannot be recommended except for a very poor grade. Zinc dross, as well known, consists of an alloy of zinc and iron. The iron in it, however, is quite variable and there is also some lead. By using it, with copper an alloy resembling manganese-bronze is obtained, but somewhat lacking in strength and elongation. If you desire to use it, take the following:

| | |
|---|---|
| Copper | 55 lbs. |
| Zinc-Dross | 44 lbs. |
| Aluminum | 1 lb. |

Zinc dross contains from 1 to 3 per-cent of iron, and this, of course, acts beneficially in the manganese-bronze in the way of hardening it and increasing its strength. The iron varies, however, and cannot be depended upon.

Question No. 1313. What is the most durable black plating for flexible steel tubing?

*Answer.* You will find a black nickel plating deposit the most satisfactory for this purpose and it can be deposited directly on the steel. You will find flexible tubing quite difficult to plate, however, as the packing in the joints absorbs plating solution and then, when it dries out, the phenomenon of "spotting-out" occurs. The only way to overcome or obviate this difficulty is to give the tubing, after plating, a prolonged soaking in several changes of clean, hot water so as to soak out the plating solution which is in the packing between the joints.

Question No. 1314. We have a quantity of scrap nickel anodes which we wish to remelt so that we can use them over again. We have a small natural draft furnace using coke and which we use for melting our aluminum for making stove patterns. We have tried to melt our nickel in it, but we seem to be unable to obtain sufficient heat to do so. Could we obtain a hotter fire by using hard anthracite coal? Also would it be cheaper to cast the anodes over again than to sell them? We obtain twenty-one cents a pound for them.

*Answer.* You will be unable to melt your nickel in a furnace with natural draft unless you have a very high stack which will produce he necessary heat in the fire. You can, however, use a forced blast on the furnace and obtain heat that will melt the nickel. Melt it in a crucible. Use a flux on the top of the nickel composed of 2 parts of lime and 1 part of fluor-spar. Cast the anodes in sand. You can probably re-cast your anodes for much less than the difference between the price of new anodes and what you obtain for scrap. If, however, you do not have a quantity, it would hardly pay you.

Question No. 1315. I would like to dry out some carbonate of nickel and have it in a fine powder like commercial carbonate of copper. In drying the carbonate of nickel, however, hard lumps form. How can this be overcome?

*Answer.* You will not be able to prevent the formation of the lumps and the only way to do, if you must have the powder, is to grind them up in a ball mill. Carbonate of nickel is always precipitated in a gelatinous condition which dries with the formation of lumps. Carbonate of copper is precipitated from hot solutions in a dense form which dries to a fine powder.

Question No. 1316. What is the advantage of the sulphate of aluminum in an electrogalvanizing solution? Does aluminum deposit with the zinc?

*Answer.* Sulphate of aluminum is used in an electrogalvanizing solution in order to produce a smooth deposit of zinc. No aluminum deposits with the zinc.

Question No. 1317. Is there a standard mixture for nickel valve seats for superheated steam? We have used an alloy of 50 parts of copper and 50 parts of pure nickel together with a little silicon-copper. The crucible has been covered with charcoal. We have melted this many times, but there is always a lot of pin-holes and blowholes in the castings. We should be pleased to have your opinion on this point and whether you consider the mixture to contain enough nickel for the purpose.

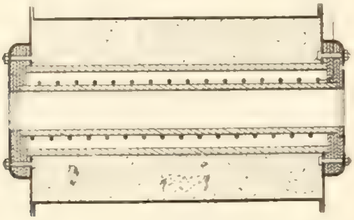
*Answer.* An alloy of equal parts of nickel and copper is largely used for the seats of safety valves and answers the purpose well as it is quite non-corrosive and hard. Your difficulty is in casting it. Try the addition of about 4 oz. of aluminum to each 100 lbs. of the mixture and melt again, after the aluminum has been added and the metal poured into pigs. This will promote soundness. You will have to melt the alloy twice, as previously mentioned, or you will not be able to obtain good castings.

Question No. 1318. I desire to obtain a silver deposit on celluloid and have a sample which, apparently, has been done in this manner. The silver is very light, and when it is scraped off, the celluloid has a light, yellowish-green color. I do not wish to use graphite or copper-bronze powder for rendering the celluloid a conductor. There must be some other method of depositing the silver on the celluloid.

*Answer.* The celluloid can probably be plated with silver in the same manner as mirrors are silvered. The celluloid is placed in the solution used for this purpose and allowed to remain there until the silver deposits on it. Of course, a very thin film only can be obtained.

# Patent Abstracts.

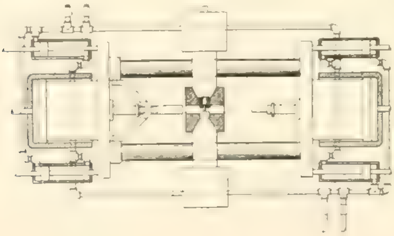
1,060,868, May 6, 1913. ELECTRIC RESISTANCE FURNACE. Leo Ubbelohde of Karlsruhe, Germany. A resistance furnace, employing wire for the resistance material.



The object of the invention is the manner of preventing the oxidation of the wire during the passage of the current, which heats it to a high temperature. The wire is surrounded by carbon which oxidizes and surrounds the wire with a non-oxidizing atmosphere.

1,062,430, May 20, 1913. ALLOY. Frederick M. Becket of Niagara Falls, N. Y. Assignor to the Electro Metallurgical Company of New York City. An alloy of manganese, titanium, silicon and carbon. The manganese and titanium are in excess of 50 per-cent. The alloy is intended as an addition agent to steel for removing oxygen, nitrogen, etc.

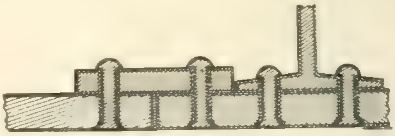
13,562, May 13, 1913. (Reissued). METHOD OF AND MACHINE FOR EXTRUDING METAL. David Long Summey of Waterbury, Conn. Assignor to the Chase Rolling Mill of the same place. The machine is for making rods, tubes and special shapes by extruding them while hot through a die. A solid billet is used. The feature of the patent lies in the chamber which contains the heated billet and the devices used with it.



1,062,287, May 20, 1913. METHOD OF MAKING CASTINGS. David Maxwell of Detroit, Mich. Assignor to the Liquid Forged Steel Company of Cleveland, Ohio. A process of compressing steel while in the liquid condition. The steel is given a series of impacts instead of a steady pressure.

1,061,964, May 13, 1913. FURNACE. David Wesley Blair of New York City. Assignor to the Metallurgical Research Company of New York City. A furnace intended for the melting and refining of metals. It is a combination of the cupola and reverberatory types and copper, or other desired metal, is melted in the upright or cupola type, after which it passes for refining to the reverberatory furnace.

1,060,930, May 6, 1913. SHIP PLATE AND HULL. John Ferreol Monnot of New York City. Assignor to the Duplex Metals Co. A method of preventing the corrosion of the steel in ships plates. The steel has copper welded to it so that the two metals are in intimate contact.

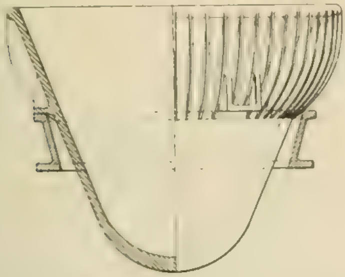


1,061,378, May 13, 1913. ELECTRIC WELDING MACHINE. John Allen Heany of Washington, D. C. A machine for welding metals and is what is known as the "spot-type." The feature of the invention lies in the automatic feeding of the work and timing it during the application of the electrodes during the welding. The apparatus is applied more particularly to the spot-welding of sheet metal goods.

1,061,256, May 13, 1913. MANUFACTURE OF SILICON. Thomas B. Allen and Frank J. Tone of the Carborundum Company of Niagara Falls, N. Y. Silica is mixed with petroleum coke and pitch and then made into briquettes. The briquettes are then heated in an electric furnace of the arc type.

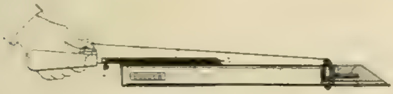
1,061,255, May 13, 1913. METHOD OF TREATING ELECTROMETALLURGICAL PRODUCTS. Thomas B. Allen and Frank J. Tone of the Carborundum Company of Niagara Falls, N. Y. A method of removing the carbides and silicides, which exist in metallurgical products, by heating them with sulphur. The process is used particularly upon abrasive metals, such as carborundum. This treatment consists in heating the finely crushed material with sulphur which removes the injurious metals.

1,061,784, May 13, 1913. POT FOR HOT METAL. Erwin C. Sherman of Youngstown, Ohio. A cast ladle for use in holding molten metals, slag, etc. The ladle or pot is cast with ribs to dissipate the heat and prevent the metal from becoming hot and cracking.



1,061,758, May 13, 1913. ELECTRODE. Carl R. Krueger of Schenectady, N. Y. Assignor to the General Electric Co. An arc light electrode composed of titanium carbide with a small percentage of metallic copper. Titanium electrodes give a flaming arc of great intensity but form slag which interferes with their regularity. By the use of a small proportion of copper with the titanium, this slag formation is prevented.

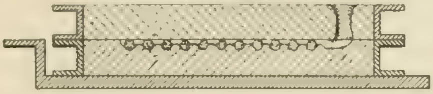
1,061,803, May 13, 1913. SOLDERING IRON. Joseph F. Balkus of Glastonbury, Conn. A soldering iron with a magazine for containing the molten solder and which is allowed to flow to the point by a duct through the bit. This is closed by a valve operated by a shaft terminating in the handle.



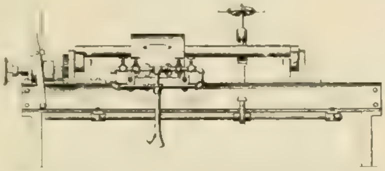
1,061,160, May 6, 1913. SAND TEMPERING APPARATUS. John Wilson Brown, Jr., of Philadelphia, Pa. Assignor to the Enterprise Manufacturing Co. of the same city. A device for use in preparing molding sand for use in molding. The sand is first passed through a magnetic separator (if used on iron) to remove pieces of iron. It is then moistened by the apparatus and conveyed to the molding machine by a continuous bucket conveyor.

1,060,839, May 6, 1913. ELECTRIC FURNACE. David J. Hauss of Aurora, Ind. An arc furnace for melting or reducing metals and alloys. The furnace is so constructed that the temperature may be controlled and so that the product may be easily removed.

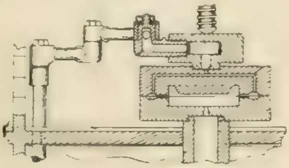
1,057,069, Mar. 25, 1913. METHOD OF CASTING TREAD SURFACES. Harry P. McDonald of Montclair, N. J. Assignor to the Snead & Co. Iron Works of Jersey City, N. J. A method of casting threads for stairways and floors. Lumps of abrasive material are cast in the tread to prevent slipping. A cast iron body is used and the abrasive material is cast by placing it in the mold as shown in the illustration.



1,060,365, Apr. 29, 1913. TUBE STRAIGHTENING MACHINE. James Rowe of Chicago, Ill. A method of straightening tubing or rods. A special machine is used and a gas furnace is placed around the part that is to be straightened. Pressure is brought to bear on the portion to be straightened and any irregularity thus removed.



1,056,442, Mar. 18, 1913. DIE CASTING MACHINE. Layton M. Parkhurst of Anderson, Ind. Assignor to the Indiana Die Casting Development Co. The invention refers to an apparatus for use in die casting and in which means are used for exhausting the air from the die, particularly when the metal is forced into the mold or die by means of compressed air.



1,061,170, May 6, 1913. ELECTRIC SOLDERING IRON. Frank M. Giffen of San Antonio, Texas. An electric soldering iron which contains a reservoir for the molten solder. The electric current, by means of a resistance coil, heats the soldering copper at the end and melts the solder at the same time.

1,062,028, May 20, 1013. SOLDERING TOOL. Nathan I. Dryfoos of Cleveland, Ohio. A fountain soldering tool from which the solder can be made to flow at the bit as desired.

## Trade Items.

The Lamb & Deyell Refining Co. has been incorporated in Providence, R. I. and has purchased the refining business formerly conducted by the Almy-Cory Company in that city. The plant on Sabin St., formerly occupied by them will be used.

The A. T. Stearns Lumber Co., Taylor and Water Sts., Neponset, Boston, Mass., manufacture wood tanks especially for the electroplating trades. These tanks are made for service and the large number in existence indicates that they have met with the approval of the trade. Prices will be quoted on application.

The Housatonic Smelting & Refining Company of Stratford, Conn. have retired from business and the plant has been closed. B. S. Judson, the general-manager, has entered the woolen business in Pittsfield, Mass. The smelting and refining of scrap metals was cardied on. C. W. Moore was formerly connected with the company.

The Rojas Electro Chemical Co., 516 West 25th. St., New York City, manufacturers of the "Rojas" solutions for coloring metals, have been rushed with business for the past few months so that it has been impossible to take on any new orders. They have, however, increased their manufacturing equipment and will be able to handle any new business that may be obtained. The large number of concerns which have installed their processes report excellent results.

A small plant is to be built at Arnold, near New Kensington, Pa. by the Aluminum Company of America, for the manufacture of aluminum foil. This foil is now replacing, to a certain extent, tin foil on account of being composed of cheaper metal. The foil will be produced in a rolling mill and this plant for the manufacture of aluminum foil is the first to be built in the United States. There are plants in France and Switzerland for making aluminum foil which have been in existence for some time.

On June 1st. the name of the National Electroplaters Association of the United States and Canada was changed to the American Electro-platers Society. On that date the new officers recently elected will assume office. The new officers elected are as follows: President, George B. Hogaboom of Newark, N. J.; First Vice-President, J. H. Hansjosten of Chicago; Second Vice-President, W. S. Barrows of Toronto, Canada; secretary, F. C. Clement of Philadelphia; Treasurer, John J. Schultz of Detroit; Editor, H. E. Willmore of Chicago. The New York society now becomes a branch of the national body. Branches are now in existence in the following cities: New York, Philadelphia, Chicago, Newark, N. J. Rochester, N. Y., Toronto, Canada, Detroit, Mich., Dayton, Ohio, Indianapolis, Ind., St. Louis, Mo. and Milwaukee, Wis. The society is making a most remarkable growth.

The Connecticut Clasp Co., Park Ave., Bridgeport, Conn., manufacturers of corset hardware, have started an electrogalvanizing plant for electrogalvanizing corset steels.

The reorganization of the Harris Typewriter Company of Fond du Lac, Wis. has been perfected and a new corporation will be organized under the old name. The capital stock is to be $1,500,000 and the increase will be made in the production, but the plant will not be enlarged. The capital stock was formerly $365,000 and the company went into insolvency.

A. Griffoul & Bo., of Newark, N. J., the well known makers of fine bronze, silver and gold castings, have bought out the plant of M. Pimlich, maker of dies and modeler, and have added it to their own plant. Mr. Pimlich is also associated with them. They will put on the market a new line of solid, cast bronze novelties of a kind not heretofore made in this country, but imported only from France and Austria.

The Belknap Mfg. Co. of Bridgeport, Conn., manufacturers of steam valves and plumbers' brass goods, have purchased a large plot of land for the erection of a new plant. This land is located on Holland Ave., near the works of Cornwall & Patterson. A factory 50 x 320 feet will be erected and which will be three stories high. A new brass foundry will be included. Railroad improvements, it is stated, have made this necessary, as the present factory is located on the N. Y. N. H. & H. R. R.

The Metal Treating & Equipment Co., Inc., 1784 Broadway, New York City have just issued a booklet entitled "Protection of Iron and Steel Against Corrosion". This company have recently put a new electrogalvanizing solution on the market and equipment for same. This solution is called by them the "Standard" galvanizing solution and it is stated that it combines all the good features of an electrogalvanizing process without any of its bad qualities. The solution, it is said, will deposit twice as much zinc in a given time as ordinary solutions and of a very soft quality.

The Gerline-Myers Brass Foundry Co. has been incorporated in Kalamazoo, Mich. with a capital stock of $20,000 to manufacture high grade brass, bronze and aluminum castings. The capital stock is all paid in. The officers of the company are President, Samuel Franklin; vice-president and general-manager, Otto Gerline; and secretary and treasurer, Samuel B. Myers. Mr. Gerline is well known in the trade, having been superintendent of the Three Rivers Brass Works of Three Rivers, Mich. for the past thirteen years. Mr. Myers was formerly foreman of the brass foundry of the Henderson-Ames Co. of Kalamazoo. A brick foundry, 600 x 100 feet is being erected. Twelve pit furnaces using coke are being installed for melting in crucibles.

The Aurora Metal Works, Aurora, Ill. was damaged by fire on May 23rd, to the extent of $10,000. Brass castings for railroad work are manufactured.

The Crescent City Bed Company of New Orleans, La., manufacturers of brass and iron beds, are to erect a new factory in that city at a cost of $25,000. It will be situated at Orange and Richard Sts.

The Indiana Brass Foundry & Mfg. Co. of South Bend, Ind. has been incorporated in that city with a capital stock of $10,000 to manufacture brass specialties. Among the incorporators is S. J. Smethers.

The Invincible Metal Furniture Company has been incorporated in Monroe, Wis. with a capital stock of $20,000 to manufacture metal office furniture and other similar metal goods. They will occupy the plant formerly used by the Monroe Mfg. Co. but which has been vacant for some time.

The Ansonia Brass & Copper Branch of the American Brass Company of Ansonia, Conn. have issued a new catalogue on their "Tobin-Bronze" and which is more extensive than any heretofore issued. It contains 33 pages and embodies much information about this useful metal, together with a large number of testimonials from leading manufacturers and shipbuilders who use it.

The new plant of the Stamford German Silver Company at Springdale, Conn., manufacturers of German-silver sheet, wire, and rods, is now completed and manufacturing has commenced. They are now prepared to fill all orders which may be received. Nickel anodes are also made by the company and they have had this department in operation for some time.

The Government in their recent suit against the so-called "Coaster Brake Trust" found good cause and imposed fines on the members as follows: New Departure Mfg. Company of Bristol, Conn., $1,000; Corbin Screw Company of New Britain, Conn., $10,000; Eclipse Machine Company of Elmira, N. Y., $10,000; Miami Cycle & Mfg. Co. of Middletown, Ohio, $10,000; Buffalo Metal Goods Company of Buffalo, N. Y. $2,000; Aurora Automatic Machinery Company of Aurora, Ill., $2,000. The decree made does not prohibit the New Departure Mfg. Co. from issuing licenses to other concerns to manufacture the brake.

B. O. Bowers & Co., 136 Liberty St., New York City, importers of "Persels" the well known nickel plating salt, are to enter more extensively into the sale of electroplating supplies and equipment. They will shortly place on the market a new plating barrel which is made in France and has met with excellent success in that country. They also announce that "Persels" nickel salts can be used with excelent results in the nickel plating of die castings, zinc and its alloys. The nickel plating may be done direct without any preliminary copper deposit. B. O. Bowers & Co. are also placing on the market a new electrogalvanizing solution.

A new annealing furnace is to be installed at the plant of the Eastwood Wire & Mfg. Co. of Belleville, N. Y., manufacturers of valves, paper-mill fittings and wire cloth.

The Standard Metal Work Company of Thompsonville, Conn., manufacturers of automobile manifolds, and bent tube work, are about to install an electroplating plant.

The M-A-Z Concealed Hinge Co. has been incorporated in Kenosha, Wis. for the manufacture of hinges. These are to be used on automobiles. The capital stock is $10,000 and a plant will be established in that city at once.

The Bristol Company of Waterbury, Conn., manufacturers of recording instruments, pyrometers, etc., are sending out to the trade Catalogues Nos. 143, 173 and 1300, describing their Recording Differential Pressure Gauges and Recording Flow-rate Meters and the "Bristol" Class III Recording Thermometers.

The Anguish Mfg. Co. has been incorporated in Detroit, Mich. to manufacture automobile radiators and stamped metal goods. J. M. Anguish, C. H. Talbot and F. C. Arthur are the incorporators. This new company has obtained the plant and equipment of the Farlinger Mfg. Co., 1506 Fort St. and will occupy it for the manufacture of their goods.

The Imperial Brass Foundry & Mfg. Co. of Painesville, Ohio, which was recently incorporated in that city with a capital stock of $50,000, will manufacture valves, steam specialties and water fittings. The brass foundry and other buildings will begin operations within a few weeks. It is stated that the manufacture of aluminum cooking utensils will also be carried on.

Smith & Richardson, Attleboro, Mass. manufacture the well known "Imperial Polishing Tank" or "Tubbing Machine" for the manufacture of small metal goods, jewelry and optical work. This can be used with or without steel balls for burnishing the work. The tank is fitted with bronze castings and it is stated by the manufacturers that it will outwear any other tank. The weight is 150 lbs. and it takes a floor space of 21 x 29 inches. A catalogue is issued about it and will be gladly sent upon application.

The Egyptian Metal Company has been organized in Lansdale, Pa. and have succeeded the Par Sil Metal Company of the same place. The officers of the company are: President, Casimir Alleva; vice-president, Dimante Alleva; treasurer, Sante T. Alleva; secretary, John J. Alleva; and general-manager, James Alleva. The metal, they state, is 99.7 to 99.9 per-cent pure copper. Its tensile-strength exceeds ordinary copper by 50 per-cent and the conductivity is not decreased as the tensile strength is increased. They claim that the metal is suitable for bearings, and a general run of castings, and that it can be cold-rolled without cracking. It is said that a trolley wheel made from the metal will outlast an ordinary trolley wheel by 300 per-cent. The main office and plant are at Lansdale and the sales office at Norristown, Pa.

The plating plant of the Traut & Hine Mfg. Co. of New Britain, Conn. is to be enlarged so that the capacity will be increased one-third. Buckles and similar small metal goods are manufactured.

A new concern called the Automatic Chain Mfg. Co. has started at 70 Ship St., Providence, R. I. and will manufacture machine made chain. This concern is owned by Albert and Edward Speidel. Gold chain only will be manufactured.

The Joseph Dixon Crucible Co. of Jersey City, N. J. are sending out to the trade a new booklet on the "Dixon's Graphite Brushes" and which will be sent to those who desire it. It describes their graphite brushes for use on motors and dynamos.

The Crosby Company of Buffalo, N. Y., manufacturers of sheet metal stampings, are completing the new factory which they have been building and which is located near their present factory, 182 Pratt St. It is expected that the capacity of the plant will be increased twenty-five per-cent when this factory is done.

The Union Pin Co., Lake St., Winstead, Conn. has been incorporated with a capital stock of $21,000. The incorporators are James Kelley of Winsted and T. H. Murray and Peter H. Allison of Torrington, Conn. This company has been manufacturing for about a year.

A building has been leased at 229 East South St., Indianapolis, Ind. by the Miami Cycle & Mfg. Co. of Middletown, Ohio, manufacturers of bicycles and motorcycles, and which will be used for the manufacture of motorcycles. This company expects to manufacture about 25,000 motorcycles during the year 1914. Some $100,000 is to be spent in enlarging their plant for this purpose.

The plant of the Lumen Bearing Company of Buffalo, N. Y. was visited by fire on Sunday May 11, which destroyed the coke and sand sheds, and wood building in the rear of the foundry. While the wood portions of the buildings were consumed, the destruction was stopped by the concrete floors and fire-doors between the pattern shop and pattern storage building. These doors acted automatically. No damage was done to the foundry proper and the replacement of the burned buildings is being carried out. Business was not interrupted at all.

Attention is called to the "Electric Cleaning Compound" manufactured by the Cleveland Platers Supply Company, Engineers Building, Cleveland, Ohio. They state that seventy-five per-cent of all plating establishments are now using an electric cleaner for cleaning their work and that it is the logical method of removing grease and oil from metal goods. They issue a book called "History of Electric Cleaning" and which will be found of the utmost interest to those engaged in plating metals. This book will be sent free to those who desire it and will supply their address and position held. All platers should have a copy.

The Westfield Metal Foundry has started in Westfield, Iowa and will manufacture brass, bronze and aluminum castings. H. J. Wheelock and J. G. Penne have charge of the business.

The Diamond Brass Works has been incorporated in Detroit, Mich. with a capital stock of $10,000, to manufacture brass goods. Among the incorporators are E. J. Shaw and W. L. Abate.

The U. S. Reduction of Chicago, Ill. smelters of aluminum and its alloys, have greatly increased their facilities for supplying the trade with their products. Their works are at East Chicago, Ind.

The Delaware Brass & Aluminum Company has been incorporated in Muncie, Ind. with a capital stock of $10,000 and will manufacture brass and aluminum castings. The directors of the company are P. J. Casey, George Simmons and John Beckett.

The American Lamp & Stamping Company has purchased a piece of land in Walkerville, Ont. Canada and will erect a plant for the manufacture of automobile lamps and plumbing supplies. The site is 65 x 250 feet and it is stated that the Edmunds & Jones Mfg. Co. of Detroit, Mich. are interested in the project.

The Hill-Brunner Foundry Supply Co. has been organized in Cincinnati, Ohio and will manufacture and deal in a general line of foundry supplies and equipment. Their main office is at Evans and South St. The company is composed of John Hill, formerly president of the Hill & Griffith Company of Cincinnati, Ohio and Fred J. Brunner, who was associated with the S. Obermayer Company for fifteen years.

The Quigley Furnace and Foundry Company of Springfield, Mass. have purchased the good will, drawings, patterns and patents of the Rockwell Furnace Company, 26 Cortlandt St., New York City, which recently went into bankruptcy. They will continue to manufacture their full line of furnaces, with the exception of those used for melting, and the portable heaters, rivet forges, etc. The latter will be marketed by the Monarch Engineering & Mfg. Co. of Baltimore, Md. The Rockwell Furnace Company was not connected in any way with the W. S. Rockwell Company of 50 Church St. New York City.

Announcement is made by the Munning-Loeb Company of Matawan, N. J. that they have purchased the exclusive rights for the manufacture and sale of the "None-Such" single cylinder and double cylinder plating barrels, covered by the patents of S. D. Catlin and formerly sold by Rockhill & Vietor. These machines are being manufactured at the plant of the Munning-Loeb Company and a number of improvements have been made on them. This company have also acquired the manufacturing rights and sale of the "None-Such" carboy rocker and will also place it on the market. New catalogues have been issued of both of these appliances and will be sent to those who desire them.

An extension to the plant of the Medina Iron & Brass Co. of Medina, N. Y. is contemplated.

The Ideal Electric & Mfg. Co. of Mansfield, Ohio have taken over the Mansfield Foundry of that city and it will be operated by them in connection with their plant.

The National Reflector Co. has been incorporated in Lewisburg, W. Va., with a capital stock of $25,000 and will manufacture glass reflectors for automobiles.

R. F. Lang, of New York City, importer of the "Royal" nickel salts and the "Royal" phosphor, manganese and silicon copper, has moved from 31 Broadway to 8 and 10 Bridge St.

It is stated that Remy Bros. of Anderson, Ind., formerly connected with the Remy Electric Co. of that place, manufacturers of magnetos, are perfecting an oil engine to enter into competition with gasoline engines.

A reorganization of the Columbian Hardware Company of Cleveland, Ohio has been effected and the capital stock of the company has been increased from $300,000 to $500,000. Builders hardware is manufactured.

A factory has been started at 7 Oliver St., Newark, N. J. by E. G. Bek a chain and mesh bag manufacturer of Pforzheim, Germany, for the manufacture of the same line of goods. The name will be the Ernst Gideon Bek Company.

The Acme Metal Company of Chicago, Ill., manufacturers of gas and electric fixtures, have moved to Manistee, Mich. and are occupying the plant formerly owned by the Manistee Watch Company and which is now defunct.

The Rochester Brass & Aluminum Company, Inc., has been incorporated in Rochester, N. Y., with a capital stock of $25,000 for the manufacture of brass, bronze and aluminum castings. The incorporators are P. J. Lembke, Joseph Strauss, and John J. Keefe.

The Pennsylvania Flexible Metallic Tubing Co., 72nd. St. and Powers Lane, Philadelphia, Pa., manufacturers of flexible metallic tubing, has recently erected its own rolling mill for making the sheet metal used in the production of this material. They will also do their own galvanizing.

The General Bakelite Company of New York City are sending out the following announcement to the trade: "As a result of negotiations between the General Bakelite Company and the Damard Lacquer Company of America, the latter company has acknowledged the validity of the Bakelite patents in question, and will pay substantial royalties thereunder. The General Bakelite Co. will continue to manufacture Bakelite lacquer and the Damard Company will continue to manufacture Damard lacquer under the license granted to it. In this connection it is of interest to note that the General Bakelite Company has recently filed a bill of complaint against G. J. Nikolas & Co. for alleged infringement of the Bakelite patents".

The capital stock of the Edwards Instrument Company of Indianapolis, Ind., manufacturers of surgical instruments, has been increased to $50,000.

The contract has been let for the new foundry plant of the Wisconsin Aluminum Foundry Company at Manitowoc, Wis. and will cost $25,000.

The Interior Metal Mfg. Co. of Jamestown, N. Y., manufacturers of metal furniture, has been reorganized with a capital stock of $80,000.

The International Acheson Graphite Co. of Niagara Falls, N. Y., manufacturers of artificial graphite are to build an addition to their plant and which will be 40 x 80 feet.

The Mascot Stove & Mfg. Co. has been incorporated in Dalton, Ga. with a capital stock of $100,000 and, it is stated, a plant will be established for the manufacture of a patent steel range.

A new four story factory is to be built at 221 Wilkinson St., Syracuse, N. Y. by the R. E. Dietz Company. This new factory will be 56 x 120 feet. Automobile lamps and lanterns are manufactured.

The Lumen Bearing Company of West Toronto, Canada have broken ground for a considerable addition to their plant and which will enable them to take care of their business to a much better advantage.

The American Brass & Iron Foundry has been incorporated in Los Angeles, Cal. with a capital stock of $20,000 to make brass and iron castings. The incorporators are H. H. Hague, A. Hauge and H. L. Kirsch.

The name of the Michigan Cash Register Company of Detroit, Mich., has been changed to the Michigan Machine Company and a line of automobile accessories will be manufactured in addition to the present line.

The Huron Radiator & Lamp Company has been incorporated in Detroit, Mich. with a capital stock of $30,000 to manufacture radiators, lamps and other accessories. Among the incorporators are Wiliam Lavin, Mark W. Lavin and M. T. Faulkner.

## Obituary:

John T. Brown, vice-president and general manager of the Damascus Bronze Company of Pittsburgh, Pa., died at his home in that city on May 20th. aged 68 years. He was a well known metallurgist and was one of the first to manufacture phosphor-bronze in this country.

James R. Huber, western sales representative of the Lumen Bearing Company of Buffalo, N. Y., died from pneumonia at his home in Detroit on May 8th. Mr. Huber was formerly chemist for the Detroit Copper & Brass Rolling Mills of Detroit and resigned his position to accept the one with the Lumen Bearing Company which he held at the time of his death.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98-99% | ℔ | .22 |
| Acid, Acetic, pure, 30% | ℔. | .07 |
| Acid, Arsenious (White Arsenic) | ℔ | .20 |
| Acid, Benzoic | ℔ | 55 |
| Acid, Boracic (Boric), pure | ℔ | .12 |
| Acid, Hydrochloric, see Acid, Muriatic. | | |
| Acid, Hydrofluoric, 30% | ℔ | .04 |
| Acid, Hydrofluoric, 50% | ℔. | .10 |
| Acid, Muriatic, 20° | ℔. | 02 |
| Acid, Muriatic, c. p., 20° | ℔ | .07 |
| Acid, Nitric, 38° | ℔ | .05⅝ |
| Acid, Nitric, 40° | ℔. | .05⅞ |
| Acid, Nitric, 42° | ℔. | .06¼ |
| Acid, Nitric, c. p., | ℔. | .08 |
| Acid, Sulphuric, 66° | ℔. | .01¾ |
| Acid, Sulphuric, c. p | ℔ | .06 |
| Alcohol, Wood | gal. | .50 |
| Alcohol, Denatured | gal. | .55 |
| Alum | ℔. | .04 |
| Aluminum, Metallic, in Ingot | ℔ | .25½ |
| Ammonium Sulphate | ℔. | .07 |
| Aqua-Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | ℔. | .04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | ℔. | .06¼ |
| Ammonia Water, c. p. | ℔. | .08 |
| Ammonium Carbonate, lump | ℔. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | ℔. | .12 |
| Ammonium Hydrosulphuret | ℔. | .30 |
| Ammonium Sulphate | ℔. | .07 |
| Ammonium Suphocyanate | ℔. | .50 |
| Amyl Acetate | gal. | 3 50 |
| Antimony | ℔. | .08¾ |
| Arsenic, Metallic | ℔. | .10 |
| Arsenic, White (Acid Arsenious) | ℔. | .20 |
| Argols, White (Cream of Tartar) | ℔. | .31 |
| Asphaltum, Commercial | ℔. | .05 |
| Asphaltum, Egyptian (Bitumen) | ℔. | .30 |
| Benzine | gal. | .15 |
| Benzol, Pure | gal. | .60 |
| Bismuth, Metallic | ℔. | 2.25 |
| Bitumen, see Asphaltum. | | |
| Blue-Vitrol, see Copper Sulphate. | | |
| Borax, Crystals or Powdered | ℔. | .10 |
| Borax Glass | ℔. | .35 |
| Cadmium, Metallic | ℔. | .85 |
| Carbon Bisulphide | ℔. | .10 |
| Calcium Carbonate (Precipitated Chalk) | ℔. | .10 |
| Chrome-Green | ℔. | .50 |
| Copper, Lake, (carload | ℔. | .15½ |
| Copper, Lake, (cask) | ℔. | .15¾ |
| Copper, Electrolytic, (cask) | ℔. | .15½ |
| Copper, Electrolytic, (carload) | ℔. | .15¼ |
| Copper, Casting, (carload | ℔. | .15⅛ |
| Copper, Casting, (cask) | ℔. | .15⅜ |
| Copper Acetate (Verdigris) | ℔. | .35 |
| Copper Carbonate, dry | ℔. | .25 |
| Copper Sulphate (Blue-Stone) | ℔. | .09 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | ℔. | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | ℔. | .15 |
| Emery Flour | ℔. | .04 |
| Emery, F F & F F F. | ℔. | .03 |
| Flint, powdered | ℔. | .01 |
| Flour-Spar | ℔. | .01¼ |
| Fusel-Oil | gal. | 3.50 |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | ℔. | .30 |
| Gum Guiacum | ℔. | .26 |
| Gum Mastic | ℔. | .70 |
| Gum Sandarac | ℔. | .35 |
| Gum Shellac, brown | ℔. | .50 |
| Gum Shellac, white | ℔. | .60 |
| Iridium | oz. | 83.00 |
| Iron Perchloride | ℔. | .25 |
| Iron Sulphate (Copperas) | ℔. | .05 |
| Lead Acetate (Sugar of Lead) | ℔ | .15 |
| Lead, Pig | ℔ | .04⅜ |
| Lead, Red | ℔ | .12 |
| Lead, Yellow Oxide (Litharge) | ℔. | 12 |
| Liver of Sulphur, see Potassium Sulphide. | | |
| Manganese, Ferro, 80% | ℔. | .10 |
| Manganese, Metallic, pure | ℔ | .75 |
| Magnesium, Metallic | ℔. | 1.60 |
| Mercury Bichloride (Corrosive Sublimate) | ℔. | 1.16 |
| Mercury, Metallic (Quicksilver) | ℔. | .40 |
| Mercury Nitrate | ℔ | 1.50 |
| Mercury Oxide, yellow | ℔ | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | ℔ | .08 |
| Nickel Carbonate, dry | ℔ | .60 |
| Nickel Chloride | ℔ | .50 |
| Nickel Metalic | ℔ | .45 |
| Nickel Sulphate (Single Salts) | ℔. | .12 |
| Nitre (saltpetre), see Potassium Nitrate. | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Paraffine | ℔ | .15 |
| Phosphorus, yellow | ℔. | .40 |
| Phosphorus, red | ℔. | 1.10 |
| Pitch | ℔. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Cloride | oz | 46.00 |
| Platinum Metallic | oz. | 48.00 |
| Potash-by-Alcohol, in sticks | ℔. | .50 |
| Potash, Caustic | ℔. | .05½ |
| Potassium Bichromate | ℔. | .14 |
| Potassium Bitartarate (Cream of Tartar) | ℔. | .31 |
| Potassium Carbonate (Pearlash) | ℔. | .10 |
| Potassium Chlorate | ℔. | .15 |
| Potassium Cyanide | ℔. | .25 |
| Potassium Iodide | ℔. | 2.25 |
| Potassium Nitrate (Nitre or Saltpetre) | ℔. | .10 |
| Potassium Permanganate | ℔. | .17 |
| Potassium, Red Prussiate | ℔. | .60 |
| Potassium, Yellow Prussiate | ℔. | .24 |
| Potassium Sulphide (Liver of Sulphur) | ℔. | .15 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | ℔. | .70 |
| Pumice, Ground | ℔. | .05 |
| Quartz, Powdered | ℔. | .01 |
| Rosin, Yellow | ℔. | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .59⅞ |
| Silver Nitrate, crystals | oz. | .50 |
| Soda-Ash | ℔. | .05 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | ℔. | .15 |
| Sodium Carbonate (Sal-Soda), crystals | ℔. | .02 |
| Sodium Hydrate (Caustic Soda) | ℔. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | ℔. | .45 |
| Sodium Hyposulphite ("Hypo") | ℔. | .04 |
| Sodium Metallic | ℔. | .90 |
| Sodium Nitrate | ℔. | .05 |
| Sodium Phosphate | ℔. | .09 |
| Sodium Silicate (Water-Glass) | ℔. | .04 |
| Soot, Calcined | ℔. | .15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | ℔. | .05 |
| Tin Chloride | ℔. | .43 |
| Tin, Metallic | ℔. | .46⅝ |
| Turpentine, Venice | ℔ | .36 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal. | .15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | ℔. | .45 |
| Wax, Carnauba | ℔. | .70 |
| Whiting (Ground Chalk) | ℔. | .02 |
| Zinc, Carbonate, dry | ℔. | .19 |
| Zinc, Chloride | ℔. | .12 |
| Zinc, Sulphate | ℔. | .06 |
| Zinc (spelter) | ℔. | .05⅜ |

THE
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## Benefits to be Derived by the Use of a Pyrometer in Casting Metals.

A molder frequently says, "The casting did not run. The metal was not hot enough." How often is this the case in a foundry! If the casting is small, the loss is insignificant, but if a large one the loss is frequently considerable, to say nothing of the loss of time and moral effect on the employees.

The customary method of ascertaining the proper pouring temperature of metal is by the eye. While the eye is quite satisfactory in the majority of instances, it places the personal equation too much in evidence and very often allows outside influences to affect the estimation of the heat of the metal. The eye of the molder may not be sufficiently accurate for judging the heat of the molten metal, or he may not have had sufficient experience in making such an estimation. Again, foreign influences may be brought to bear upon the judging of the heat which will either prevent any accurate estimation of the temperature or greatly affect it so that it will be rendered quite uncertain. One of these influences, and a very frequent one too, is that of light. Molten metal, when judged by the eye, always appears very much hotter in the dark than it does in a good light. When the sun shines on it, it will likewise seem at a lower temperature. Therefore, when one becomes accustomed to judging the temperature of metal by means of the eye, a uniform light is necessary in order to render such estimation uniform from day to day.

It is [illegible] that the [illegible] is impossible [illegible] and the [illegible] and yet the pouring must be carried on in the same manner and the temperature of the molten metal must be estimated by the eye under each [illegible] although [illegible]

It can readily be understood, therefore, how uncertain the eye may be in estimating the temperature of molten metal. While under favorable conditions it may give good results the influence of light alone may be sufficient to cause an error in estimating the heat which would prevent the proper running of the casting.

For estimating or rather accurately determining the pouring temperature of metals, the pyrometer will be found to give absolute results and entirely eliminates the personal equation. Every casting requires a certain heat to run it, and when this is known, which can easily be determined by experiment, it is a simple matter to lay down a rule about the degree of heat at which this casting must be poured. The pyrometer is already in use in some of the leading establishments making castings and has been found quite satisfactory for such a purpose.

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## Advantage of Sodium Sulphite Over the Bi-Sulphite in Plating Solutions.

Sulphites in cyanide plating solutions have the advantage of preventing the formation of sub-salts (basic-compounds) and, accordingly, serve to produce bright, clean deposits. Their use is more or less extensive and it has always been the custom to use sodium bi-sulphite for this purpose. This salt is usually called "bl-sulphite of soda."

Why the sodium bi-sulphite was first employed is unknown, but the fact remains that its use has crept in so that formulas for plating solutions, in which it is used, specify the bi-sulphite and not the sulphite.

The use of sodium bi-sulphite in plating solutions is chemically wrong and sodium sulphite should be used instead. The reason is as follows:

Sodium bi-sulphite is an acid salt, and when added to a cyanide plating solution, it neutralizes a portion of the free cyanide present and then itself becomes sodium sulphite. The use of the bi-sulphite, therefore, is accompanied by bad results, inasmuch as it neutralizes a part of the free cyanide and thus disturbs the balance of the solution. When this has been done, the bi-sulphite, of course, is converted into sodium sulphite.

Sodium sulphite is a neutral salt and when introduced into a cyanide plating solution will not affect the free cyanide in any way and the same results are obtained, as far as the sulphite is concerned, as though the bi-sulphite were employed. Its use is theoretically correct.

The use of sodium sulphite in place of the bi-sulphite is recommended for the reason that it will not disturb the free cyanide in the plating solution, and at the same time all the value obtained with the bi-sulphite will be produced as far as cleanliness and brightness of the deposit are concerned. For copper, brass, bronze or gold solutions the sodium sulphite can be substituted for sodium bi-sulphite, and it will be found that the free cyanide in the bath will not be disturbed at all.

---

## Copper Production of the World.

According to statistics recently issued by Henry R. Merton & Co. of London, the copper production for the world for the year 1912 was as follows:

| | Tons |
|---|---|
| United States | 554,835 |
| Spain and Portugal | 58,930 |
| Russia | 33,040 |
| Mexico | 70,845 |
| Japan | 65,500 |
| Australia | 47,020 |
| Canada | 34,710 |
| Chili | 37,307 |
| Germany | 20,180 |
| Miscellaneous | 82,150 |

It will be noticed that the United States produces over one-half of the entire copper production of the world. The total quantity of the various countries given in the above table is 1,004,485 tons of which the United States produced 554,835 tons.

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Societa Metallurgica Italiana, office at Leghorn, Italy, making all kinds of worked copper, has a working capital of about $2,000,000 and employs 800 to 1,000 men. The annual consumption of copper is nearly 20,000 tons.

# Charcoal and Its Value in Brass and Bronze Melting, Its Manufacture and Method of Using.

The manufacture of brass and charcoal seems to be inseparable and it has frequently been said that it is impossible to make good brass without it. While the use of charcoal seems a small matter, it is an extremely important one, and if more attention were given the subject in the melting of brass and bronze, less difficulty would be experienced in making good castings. It is almost possible to divide the good and the poor makers of brass castings into two kinds: Those who use charcoal in melting and those who do not. In the brass rolling mill business, where the finest kind of metal is made, charcoal is imperative, and in copper refining as well it is impossible to get along without it. The value of charcoal, it is believed, is not generally appreciated and many brass founders look upon it simply as an expensive form of fuel, and attempt to substitute the less expensive coal or coke, with the inevitable result that the metal is injured.

Let it be said that the value of charcoal lies wholly in its freedom from sulphur. If coal or coke were equally as free, there would be no object in using charcoal, but unfortunately they are not and in order to prevent sulphur absorption during the melting of the metal, it is necessary to keep it covered with charcoal which supplies a reducing atmosphere all the time and which is completely free from sulphur. In the iron and steel industry, charcoal is used for the same reason and in copper refining, the charge of molten copper is kept covered all the time with it so that not only a reducing atmosphere is obtained, but one that is entirely free from sulphur.

Manufacturers are just awakening to the fact that sulphur is far more injurious in brass and bronze than formerly supposed. It has

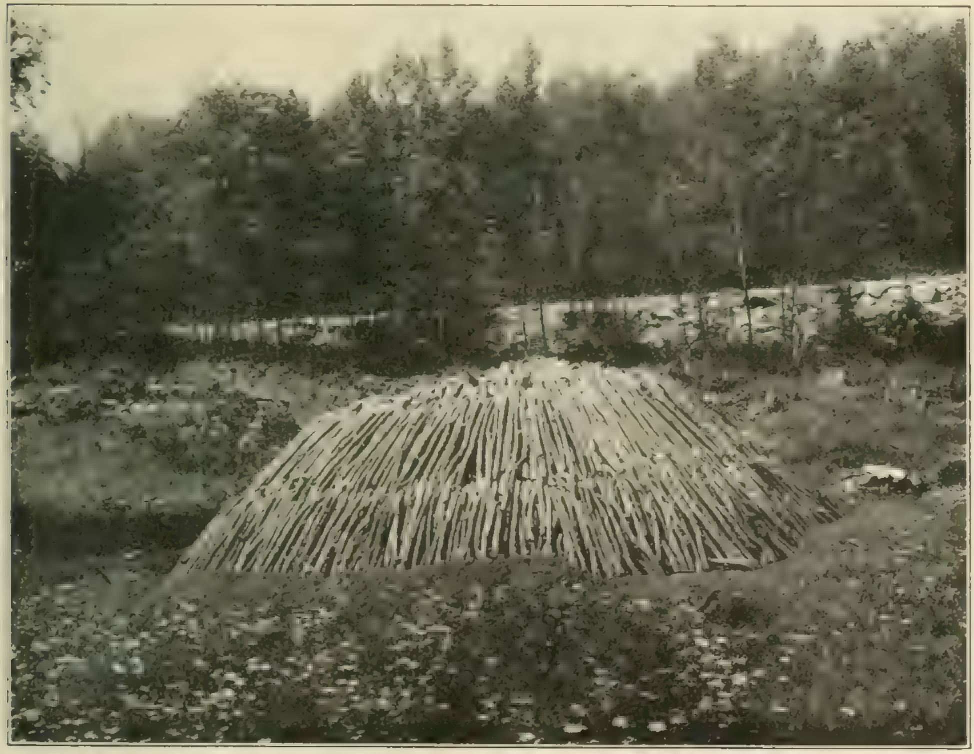

Fig. 1. Wood Pile Used As the Staring Point for the Manufacture of Charcoal by the "Pit" Process. Photographs Show Method as Conducted in Easton, Conn.

been passed over lightly and little attention has been paid to it. Brass or bronze analyses rarely show any determination of sulphur, and in copper it is quite important that sulphur determinations should be made, yet it is seldom done. Sulphur should always be considered in brass and bronze analyses and it will often be found that it is the cause of difficulty. It will produce blowholes or pinholes, and in sand castings it will produce a dark or black skin upon the surface. The more sulphur that is present, the darker the skin, and if bright, clean casting are desired, then metal free from sulphur will be required.

### *Sulphur Cause of Poor Scrap Metals.*

It is a fact not generally appreciated that copper and its alloys, such as the brasses and bronzes, absorb sulphur readily during melting, and after it has once been taken up, it will not become eliminated. In fact, it will absorb more each time metal is melted, provided, of course, that there is sulphur in the fuel, as there generally is. Therefore, metals which have been melted over and over absorb more and more sulphur and thus become contaminated to a considerable extent, so that they cannot be used with the success following that produced with new metals. The only change, in reality, will be found in the sulphur content and it can really be said that the only differences between scrap metals and the same mixture made from new materials is the sulphur content. This very fact has been the means of confusing metal consumers and led them to think the element of mystery has entered the problem. Analyses of both new metals and scrap have shown the same results and, for this reason, the matter has been quite perplexing; but it will always be found that these analyses fail to show the sulphur content, and it is this sulphur which is the cause of the different action of the scrap metals. If the sulphur had been determined in the scrap, it would have shown the reason for the difference between it and the new metal mixture. It is the sulphur then which causes scrap to be inferior to new metals.

Sulphur is not removed from brass or bronze on melting and each time it is melted, if the fuel contains sulphur, the quantity in the brass and bronze increases, so that the greater number of times the scrap is melted over, the more sulphur is absorbed and the poorer the scrap. This fact will serve to explain why some scrap is worse than others, although it may show the same chemical analysis (without a sulphur determination).

Manganese has more affinity for sulphur than any other element and it is used in steel for removing the sulphur from it. The manganese combines with the sulphur forming manganese sulphide and rises to the top as a slag. It is possible that the same thing would happen in the brasses and bronze which contain sulphur, and perhaps the addition of a little manganese would convert a sulphurized scrap into good metal. Whether this has yet been accomplished is unknown, but it is apparently worth consideration.

### *The Action of Charcoal in Melting.*

In melting metals, it is the object, as far as possible to prevent the introduction of sulphur into metal. This fact does not seem to be understood and the majority of brass founders cannot tell why charcoal is used on the metal and they use it because "it is the custom." The fact nevertheless remains that the sole object of using charcoal is because it contains no sulphur. Were it not for this fact, it would not be employed.

In melting with coal or coke, the metal, if left unprotected in the crucible, comes in contact with the products of combustion which, of course, contain sulphur. In this manner the sulphur is absorbed. By the use of charcoal on the surface of the metal, it is protected from the products of combustion, and at the same time from any sulphur absorption. One might naturally think that any non metallic material such as sand, would answer the same purpose and so it will to a limited degree, but it fails in one thing and that is it acts as a simple covering. Charcoal, when present on the surface of the metal, not only acts as a covering free from sulphur but supplies a reducing action as well. This reducing action is a very important consideration as it prevents the formation of oxide. The charcoal, then, has two valuable features:

1. It acts as a covering for the metal and prevents the absorption of sulphur.
2. It has a reducing action and prevents the formation of oxide, or if any should form, it reduces it to metal.

### *The Way to Use Charcoal.*

Although simple in its use, many brass founders do not employ the most efficient method. In the first place, the charcoal should not be in large pieces as they will have such a large space between them, when used on the molten metal that considerable air and products of combustion may find their way through to the metal itself. Charcoal always comes in large pieces, such as shown in Fig. 4, and these will be found too large for use. They should always be broken up so that the metal can be well covered. Pieces about the size of a walnut are preferable and are shown in Fig. 5. When of this size they will completely and effectually cover the melted metal and protect it from the air and products of combustion. On the other hand the charcoal should not be too fine as it then burns rapidly and will not become effectual in protecting the metal.

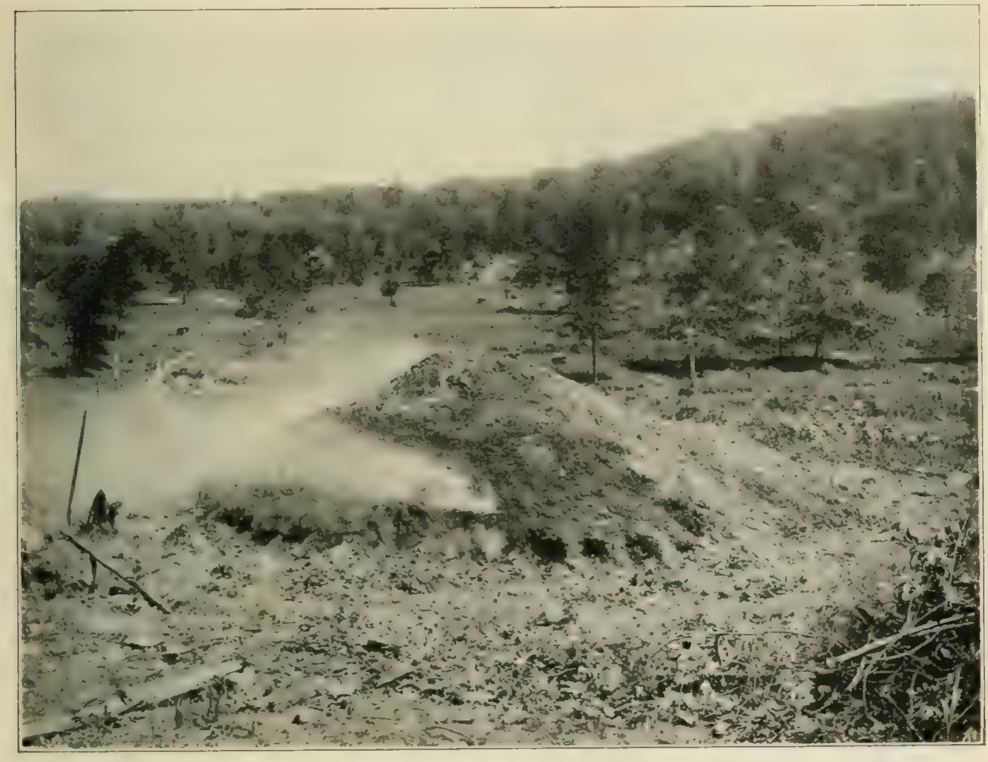

Fig. 2. Wood Pile Burning for the Manufacture of Charcoal and Covered with Dirt and Sod to Prevent Complete Combustion.

In melting metals it is preferable to place a small quantity of charcoal in the crucible with the metal so that when it begins to melt a reducing action will be set up. A small quantity in the bottom of the crucible is advantageous as it covers the first portion of the metal which melts and runs to the bottom. Then as soon as the metal forms a pool in the bottom of the crucible, it will be constantly covered with the charcoal. When the metal has been placed in the crucible, it should be covered with charcoal on the top so that it will be amply protected when the melting begins. It is wrong to assume that no charcoal is necessary until the melting begins, for the reason that, while no sulphur is absorbed until the metal is actually melted, it is impossible to "catch" the exact point at which the melting takes place so that there may be a period when the melting is taking place that no charcoal is present. Sulphur is then absorbed to a certain extent and oxidation may take place. By placing some charcoal on the top of the metal, it will be protected from the time the actual melting takes place.

In melting, it is always unwise to have pieces of metal projecting above the top of the crucible. Not only is it impossible to cover them with charcoal, but they have the best opportunity to oxidize and absorb sulphur. All metal should be below the top of the crucible so that it can be well covered with charcoal.

As the melting begins, it may be necessary to add more charcoal so as to keep the surface well covered. It must be kept fully protected with charcoal at all times and a layer of an inch or so is about right. More than this is unnecessary and prevents the crucible from holding the full quantity.

Observe the following rules in the use of charcoal in melting:

1. Do not use too coarse charcoal.

2. Place a small quantity in the bottom of the crucible when the metal is put in.

3. Cover the top of the crucible well with charcoal when the crucible is placed in the fire and before the actual melting takes place.

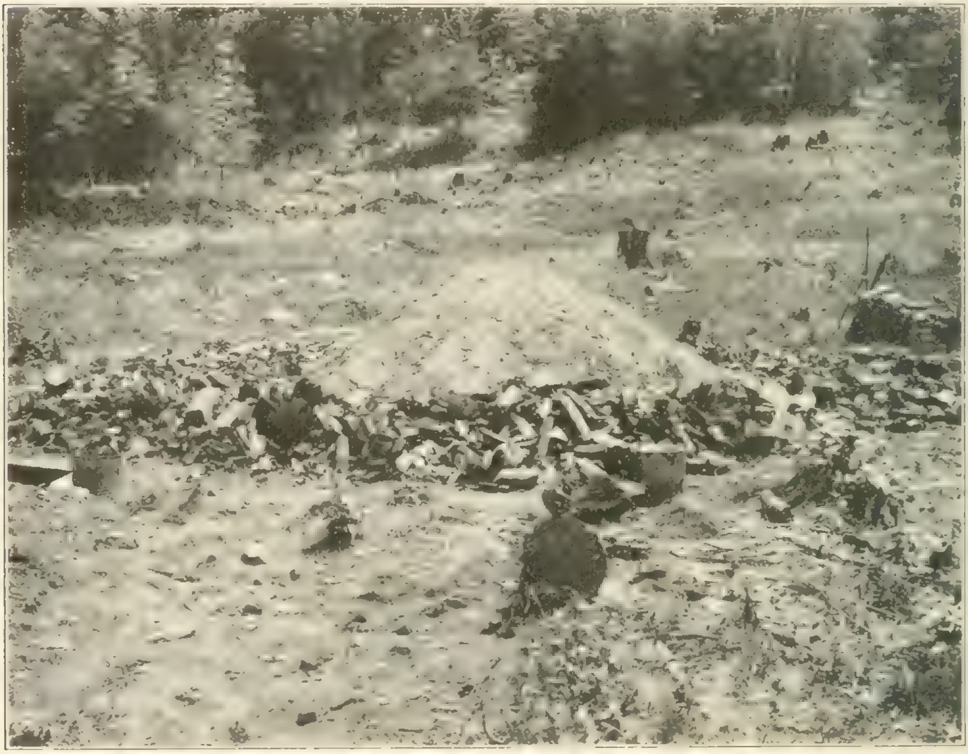

Fig. 3. The Completion of the Charcoal Process and Showing the Finished Charcoal.

4. After the melting begins add more charcoal so as to keep plenty in the crucible.

5. See that the molten metal is kept fully covered with about an inch in depth of charcoal at all times while the melting is taking place and at no time allow the metal to become exposed. The object is at all times to have the metal fully protected with charcoal for the reason that it is the melted metal and not the solid metal which absorbs sulphur and oxidizes.

### *Kinds of Charcoal.*

Charcoal is found on the market in two varieties, both of which are charcoal but made in different manner. They are:

1. Charcoal made by the old-fashioned method burning the wood in the open air, covered by sod or dirt.

2. Charcoal made in retorts.

The amount of charcoal made by the old-fashioned method of burning a wood pile while protected by dirt or sod is small compared to that made by the retort method, but most of that used in Connecticut by brass manufacturers is made by this method. It is made principally from hard wood, like oak, chestnut or birch so that the charcoal which results is to be preferred to that made from the softer woods by the retort process. If, however, hard woods are used in the retort methods it is believed the charcoal is equally as good.

The old fashioned method of making charcoal in Connecticut is herewith illustrated and the photographs were taken at the charcoal pits in Easton, Conn., from which a considerable portion of the charcoal used by the Connecticut brass manufacturers is obtained. The method of burning is as follows:

The wood, mostly small stuff which cannot be used for timber, is cut in about 4 foot lengths and drawn to the pile. No attempt is made to season it as it is unnecessary, although seasoned wood can be burnt with equal facility. The wood is piled in a conical shaped pile as show in Fig 1 and is then ready for burning.

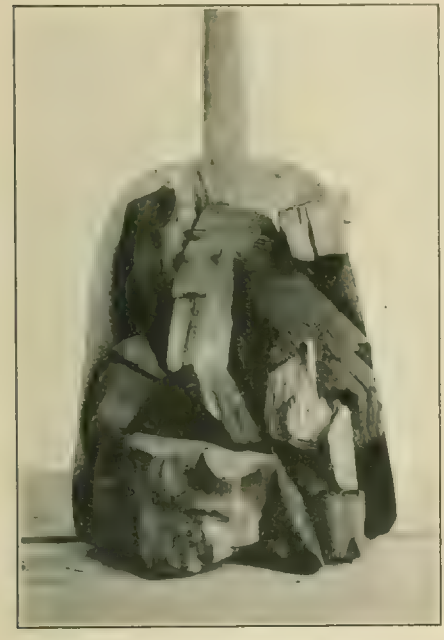

**Fig. 4. Charcoal as Received by Manufacturers. Too Large Pieces for Satisfactory Use.**

The wood pile shown in Fig. 1 is then covered with sod and dirt so that the wood will not actually burn, but the volatile portions will be driven off and the charcoal left. When covered with the dirt and sod, the pile is lighted and allowed to burn. Openings are left for the escape of smoke and gases driven off from the charcoal.

In Fig. 2 is shown a pile actually burning. The holes, through which the gases and steam escape may readily be seen, the pile must be well covered with dirt in order to prevent the burning of the charcoal itself, and it requires constant attention in order to keep the operation normal. Huts are built near the pile and in them the men who look after the process live. Night and day they are obliged to attend to the burning and see that it takes place right, the dirt is not blown off, and that there are sufficient holes in the right place to allow the escape of the gas.

Smoke and a tarry matter escape from the holes, as may be seen in Fig. 2. The burning takes from ten days to two weeks, depending upon the condition of the wood and the size of the pile. The charcoal burner, as the attendant is called, knows by experience when the pile is burnt and no further volatile matter can be driven off. He then covers the pile completely with dirt, so that no further combustion will take place and allows the whole to cool. When the heat has been lowered so that the pile can be worked, the dirt is removed and the charcoal loaded into wagons for transportation. In Fig. 3 is shown such a pile which has already been opened up and a portion of the charcoal taken away. The charcoal sells for about 12 cents per bushel.

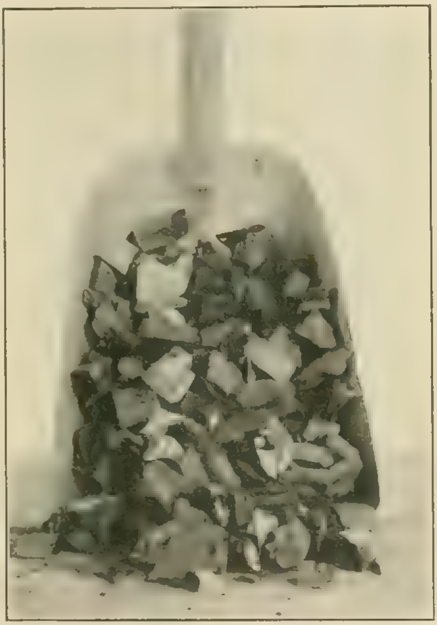

**Fig. 5. Smaller Pieces of Charcoal Broken Up for Use.**

The foregoing method of making charcoal is called the "pit" method and all the volatile material, of course, is lost. No attention is paid to anything except the production of the charcoal itself. In the other method, or the "retort" process, every thing is saved so that it is, by far, the better process although one which requires a special plant for the purpose.

*The "Retort" Method.*

In the "retort" method of making charcoal, the wood is heated in closed retorts and the volatile products driven out, condensed and saved. In this manner everything in the wood is obtained and the process seems to be profitable judging from the quantity of charcoal thus produced by it.

The retorts hold about six cords of wood and hard wood is used when it can be obtained. Maple, beech and other hard woods are used. Soft woods do not work as well and produce a softer charcoal which is not as salable.

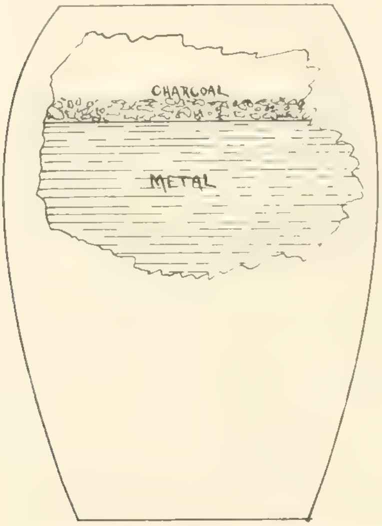

**Fig. 6. Method of Using the Charcoal on Melted Metal.**

The product distilled over is called "pyroligneous acid" and contains tar, acetic acid, acetone, wood alcohol, and formaldehyde. This acid is redistilled, to remove the tar, and then treated with lime to neutralize the acetic acid and form acetate of lime. This acetate of lime is sold and is further used for making pure acetic acid or for other chemical purposes. Further fractional distillation removes the alcohol and additional treatment of the acetate of lime is used to obtain the acetone and formaldehyde. The acetone is sold to smokeless powder manufacturers.

Some recent statistics of the manufacture of charcoal by the retort method in Canada have recently been published and may be of interest. It is stated that four companies are in existence in that country with a combined capital stock of $5,965,000. About 2300 men are employed. The amounts of the various products obtained from these countries for the past year are as follows:

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|---|---|
| Charcoal | 8,000,000 bushels |
| Acetate of Lime | 14,000 tons |
| Wood Alcohol | 1,019,00 gallons |
| Acetone | 400 tons |
| Formaldehyde | 1,400 barrels |

The economy of the "retort" method of making charcoal will at once be apparent, from a consultation of the table above and where plenty of fuel is available, the business must be profitable.

## The Supply of Emery.

The world's supply of emery comes from Greek islands and from Asia Minor near Smyrna. Importations into the United States, which average $250,000 annually, have been hampered within the past year because of disturbed conditions in the Balkans and the withdrawal from industrial life of so many men for the armies. Some American manufacturers have been inconvenienced by the delay in emery shipments. In this connection the following European press dispatch from Athens will be of interest:

It is thought that the bill passed by the Greek Chamber regulating the emery trade of Naxos, one of the Greek islands supplying a large proportion of the world's requirements of soft polishing emery, will result in the speedy settlement of the strike for higher wages of the workers engaged in obtaining the mineral. The minimum selling price of Naxos emery is fixed by the bill at 65 francs ($12.54) per metric ton (2,204.6 pounds), while first-grade emery must not be sold below 110 francs ($21.23) per metric ton. The grading of the mineral will be under the control of three Government officials stationed on the island, while all sales have to be checked by a special agent stationed on the neighboring island of Syra, where the product has to be shipped after sorting. The agent will give a certificate with each lot sold, which will contain particulars regarding the quantity, quality, selling price, and steamer by which reshipment will be made. Heavy penalties will be enforced in cases where false information on these points is given.—*Daily Consular and Trade Report.*

# Preventing "Spotting-Out" of Plated Work by Means of Hot Water.

Even at this late day, platers seem to experience considerable difficulty with the spotting-out of electroplated work. It is manifested principally in the case of castings which have been copper, brass or bronze plated, or in other words, which have been plated in a cyanide solution. It can well be said that much of this trouble is caused by too much haste in rinsing the work and that if hot water is brought into play, it will be found quite an easy matter to overcome the spotting-out.

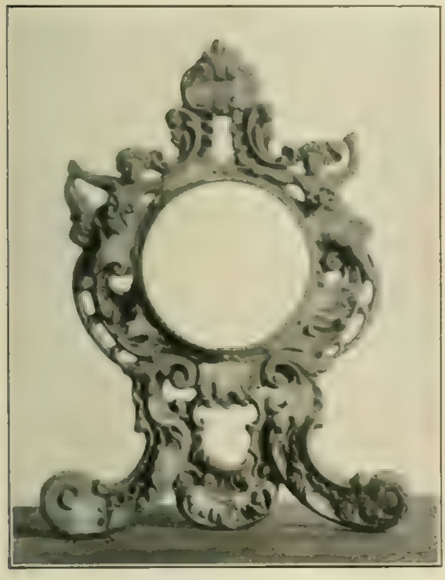

**Fig. 1.** Cast-Iron Clock Case Which Spotted Out After Plating.

Spotting-out will occur on any kind of work, if it contains holes or pores into which the plating solution can penetrate, but sheet metal or wire, which is not porous never bother a plater, unless it is a joint on the metal into which the plating solution can penetrate. Castings are the material that will always bother a plater and it is for this reason that they are unsound. Brass castings will give less trouble than gray-iron or malleable-iron, and it will be found that the most difficulty with spotting-out will be experienced with malleable iron as it seems to be more unsound, generally speaking, than gray-iron, although the latter will give trouble enough.

The cause of spotting-out is that the plating solution, during the plating operation, enters the pores, cavities or other imperfections in the casting and, not being removed during the rinsing, gradually works out to the surface of the metal after it has been finished. If this plating solution is removed before the goods have been finished, then there will be no spotting-out for the reason that there is nothing to do the spotting.

The imperfections or cavities in a casting may not be apparent to the eye, but may be present nevertheless. For example, malleable-iron or gray-iron castings may be very bad, as far as blowholes or other porosity are concerned, but if they often are, the surface of such cavities is hammered down during the tumbling and they do not become visible to the eye; but at the same time, back of them may be a large cavity. In Fig. 3 is a sketch illustrating this point. Let the sketch be taken as a cross section of a casting containing blowholes, but which has been tumbled. The surface, being hammered down by the tumbling operation, closes up the holes so that, to all appearances, the castings are sound. However, there may be large holes, as shown in the sketch, back in the interior of the casting. It is these holes which contain the plating solution, and from which it will work out during or after finish-

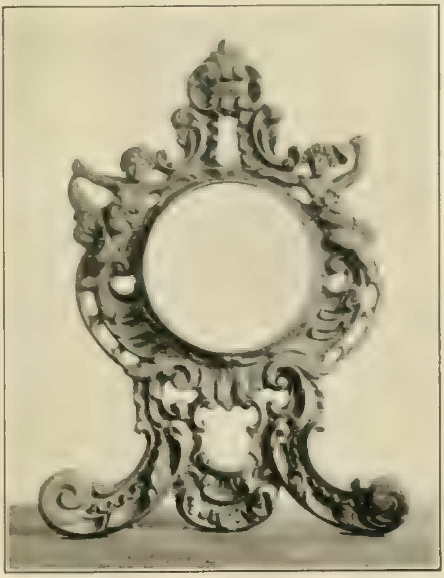

**Fig. 2.** After Treating by the Hot Water Method.

ing to cause spotting-out. To render the plating successful, therefore, the solution must be removed from the holes.

Suppose the solution is a brass plating bath and made with potassium cyanide, and it enters the holes and causes spotting-out. To remedy the trouble, it must be removed. The simple application of heat will not overcome the trouble for the reason that it will simply evaporate the water and leave the solid matter. Potassium cyanide, however, is delinquescent or in other words absorbs moisture from the air and liquefies so that even if once dried out, it will again become liquid and cause a continual spotting-out. The only safe method is to remove the plating solution completely and this can only be done by means of water.

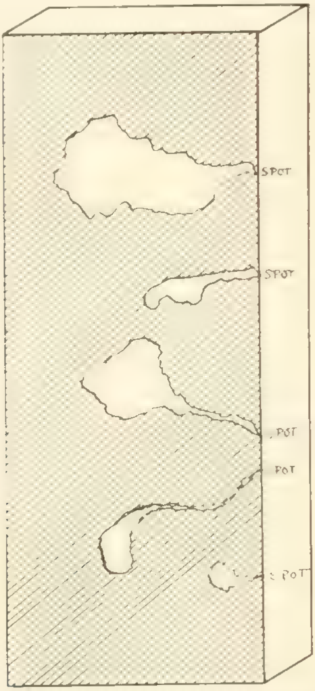

**Fig. 3. Sketch Showing How Cavities Affect Spotting Out and Still Cannot be Seen at the Surface.**

Water is the best solvent, of course, for the plating salts and, naturally, is the best substance for removing the plating solution from the cavities in the casting. Hot water is always a far more energetic solvent than cold water, and for this reason it is to be used for removing the plating solution. The hotter it is the more energetically and rapidly it will work. It will be found very advantageous, as far as effectiveness and rapidity are concerned, to have the water actually boiling.

*Method of Using the Hot Water.*

In the case of a casting which is porous and will show an extra case of spotting-out, the following method of treating should be carried out:

Remove from the plating solution and rinse off all of the adhering solution in clean, running water. It is now ready for the hot water treatment. Obtain a clean barrel and fill full of clean water. Place the work in it and run a steam pipe down into it and heat up to boiling. Allow to remain in this condition for half an hour, then throw the water away and fill up with clean water again, heat with the steam for another half hour and then remove the work. It may be necessary, if the castings still spot out, to repeat the operation several times more and a plug or cock placed in the bottom of the barrel will facilitate drawing off to fill up with fresh water. The object of these repeated treatments is to rinse out, so to speak, all the plating solution in the pores and cavities in the casting, and fill up with water. This water can afterwards be easily removed.

When, by this hot water treatment, all the plating solution has been removed from the cavities and imperfections in the plated castings, the water has taken its place and, instead of plating solution being in them, water only is present. To remove this (and it should be done), simply place the castings in an oven for an hour or so to evaporate it from the surface.

The alternate heating and cooling the castings while they are being soaked out in hot water, by first placing in cold water and then heating to boiling, serve to "pump" the plating solution out, so to speak, and leave nothing but clean water. Care must be taken to use nothing but clean water in the barrel so that, when it has taken the place of the plating solution in the pores and cavities of the casting, there will then be nothing but water to dry out.

After drying it off in the oven, the casting can be finished by buffing or otherwise and there will be no danger of spotting-out.

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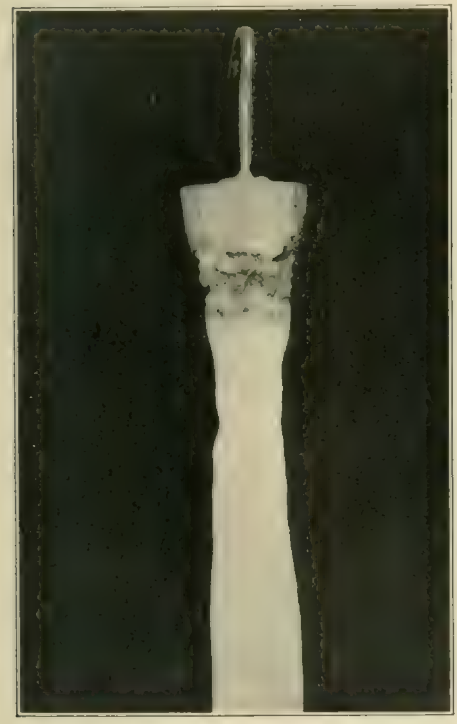
Sal-soda is crystallized sodium carbonate, while soda-ash is dry sodium carbonate. These names apply to commercial articles, while the pure substance is known simply as sodium carbonate.

## The Waste Ends of Anodes.

The problem of waste ends of anodes is an important one and it does not seem to be any nearer solution than many years ago. It forms quite a loss in the plating trade and attempts have been made to coat the hooks over with various non-conducting materials, such as asphalt, celluloid, etc., but without solving the problem.



**Anode Showing How Action Takes Place at Junction of the Solution.**

The formation of these ends takes place whenever the anode projects out of the solution. In the case of silver anodes, the use of iron hooks by means of which the anodes are completely immersed in the solution and which are not affected to any degree, prevents to a great extent the waste that takes place in other solutions. By making two holes in the anode, one at the top and the other at the bottom, so that it can be reversed, it will be found possible to use the anode nearly all up and what is left is as thin as paper.

In the case of anodes which are held by hooks out of the solution, there is always an action at the top of the solution greater than at other portions. In the illustration, herewith shown, this point may be understood. The anode was a copper one and was used in a plating barrel, and the action at the top of the plating solution may be readily seen. The anode frequently cuts through at this point before the base is used up and then produces a considerable waste, and there result both the butt-end and the top as well. There seems to be no method of preventing this cutting through. While in the case of copper anodes, the use of iron hooks will partially solve the problem, provided a cyanide copper solution is used, it will not answer, of course, in case an acid copper solution is employed.

When nickel anodes are employed (and nickel forms the leading electroplating business carried on) there has yet been no way of preventing the waste,, and the butt-ends etc., must be sold as scrap. The cutting through at the top of the solution will not always take place as it is not infrequent to find that a nickel anode will wear down very thin and evenly, but, in spite of this, the end will remain. The cutting through at the top of the solution before the rest of the anode is used, is a matter apparently not well understood, and why it should occur in some instances and not in others has not been explained.

It would appear, therefore, that there is much room for improvement in the anode portion of the electroplating industry in order to prevent the extensive waste which now occurs in that portion which is used outside of the solution. Coating it with non-conducting materials, such as asphalt, celluloid etc., does not achieve the desired purpose and it is at once apparent that some other method must be used. The ideal way would be to find a hook which would not be attacked by the solution itself, and by means of which the whole anode could be immersed in the solution and thus dissolve wholly without affecting the hook. This material, of course, would have to be a conductor and so far no metal except gold or platinum has been found that will answer the purpose and these are too expensive to allow of use.

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It has been stated that the number of cases of lead poisoning in South Wales, Great Britain, from 1907 to December 1st, 1912, were seventy-seven, of which four were fatal. Since 1910, however, the number showed a marked decrease.

## Tin.

[illegible] and [illegible] from which we make the following abstracts:— Although technical opinion is adverse to the [illegible] civilization before the commencement [illegible] constant composition of exactly 10 per cent. of tin with 90 per cent. of copper, [illegible] when the metallurgical properties of iron were not known.

### *Early Bronze in Europe.*

[illegible] be known when bronze first [illegible] tain that it was gradually being replaced by iron about 400 B. C. It is very difficult to de- [illegible] If we attribute [illegible] of pyritic [illegible] tite inconceivable how, in all the old bronzes, excepting some of the Chinese, [illegible] From the metallurgical point of view it can only be presumed that the extraction of tin from tin ore preceded the first production of bronze, as the white metal is easily separated from its ore under a cover of glowing charcoal. Metallic copper, either as a natural or artificial product has, however, been known to mankind from a very early era.

The occurrence of tin is geologically very restricted, which is attributable to the fact that tin, like gold, in its natural state hardly forms any salts soluble in water, except the chlorides, bromides and iodides, but above all no soluble oxygen salts. This is why tin ore, almost without exception, appears in very old rocks, and generally in those containing mica. It is especially in granite or in quartz-porphyry, which is a volcanic rock similar to the former in its petrographical properties, that tin ore is found, both in veins and also in stringers.

Certain old slate and micaceous schist rocks, like those in Cornwall, which contain tin, no [illegible] and decomposed granite. Tin ore is also sometimes found in so-called secondary strata, in alluvial hills, which contain fragments of old tin-ore beds.

### [illegible] Tin Mines.

[illegible] must have been begun independently in at least [illegible] designations for the white metal. The word "nak" or "nag" forms the root of one, which is found, for instance, in the Sanskrit [illegible] unmistakably originated from the rich [illegible] which still at the present day supplies a large [illegible] d's consumption of that metal. [illegible] viz., tin, zinn, étain, stagno, estana, &c., is de- [illegible] Gallic root "istan" and [illegible] home of tin industry.

[illegible] n from the mines of the Iberian Peninsula, but later they also drew upon those of Great Britain, which was therefore named Cassiterides, or Tin Isles, by the Greeks (the Greek word, "kassiteros," derived from a Sanskrit word, "kastra," seems originally to have been a trade word). The Spanish and Portuguese tin-ore beds were exhausted more than 1,000 years ago, while the mines in Cornwall are still supplying tin, although from an ever-increasing depth. A considerable dearth of tin would have ensued in Europe but for the fact that by the discovery of the passage to East India in the sixteenth century, Malacca could once more be drawn upon, as in ancient times, for a part of its enormous tin wealth.

### *Modern Tin Fields.*

Later on, Siam and the Malay fields of Banca and Billiton supplied Europe with considerable quantities, and within the last sixty years Victoria, New South Wales, and Tasmania have become producers. America, in spite of its enormous granite rocks, has proved to be very poor in tin ore, with the exception of Bolivia, which in 1909 supplied 21,340 tons. About half of the world's demand is, however, supplied by Malacca, which must already have supplied the Orient for countless centuries with a great part of the tin for its extensive output of tinware. Of the 118,200 tons of tin which, in the year 1911, were obtained in the whole world, not less than 57,944 tons, *i. e.*, about 49 per cent., were derived from that peninsula. During last year England produced only 4,500 tons from her own ore. In 1910, when the world's production amounted to 105,764 tons, the islands of Banca and Billiton produced 14,000 tons, Australia 4,500 tons, China 4,500 tons, England 5,750 tons, and Malacca 54,000 tons. About two years ago Nigeria appeared as a tin producer in the world's market, but the expectations regarding it do not appear to be quite realized, in spite of the fact that the export of tin ore from this colony has risen from 700 tons in 1910 to 1,400 tons last year.

### *Uses of Tin.*

By far the greater part of the tin produced at the present day is used for the manufacture of tinplate. As it possesses the advantage of not being affected by acids, tinplate is used for making kitchen utensils and for the canning of food. Also, as tinfoil, it is used for packing tobacco, soaps, chocolate, and other articles that have to be preserved against atmospheric moisture, and for the metalizing of mirrors. Tin is also extensively used in the manufacture of tin plating, tin enamel, majolica and opalescent glass, and in the form of various salts for dyeing and other chemical industries. A most important application of tin is, of course, for the purpose of soldering as, with the exception of the precious metals, there is no other metal which is so effective for this purpose. It is a matter for consideration, in view of the fact that tin is so indispensable, to note that its price in the last decades has risen so rapidly.

### *The Coming Tin Famine*

It ought to give rise to serious reflection from an economic point of view that, notwithstanding the great rise in price, the world's production has in the last few years increased but slightly, and has even, compared with 1910, suffered a decrease. As stated above, tin ore is found in very few rocks and its occurrences are limited, but the circumstance that this ore is so insignificant in appearance, not having any metallic glitter, leads one to hope that in some remote corner of the world some rich ore beds may yet be discovered. For instance in the author's opinion, the large granite masses of North America, Further India, and the East Coast of Sumatra are likely locations. However, from what is known of the geological conditions of the earth, such extensive tin-ore beds as those of Malacca are hardly likely to be found. The exhaustion of these latter is, in spite of contradictory opinion, only a matter of decades, or at most of two centuries, if the consumption of tin should increase as it has done in the last hundred years. From Banca, Billiton, and England not much more is to be expected, so that it can almost be affirmed with certainty that mankind will be faced with a tin famine at a not very distant time. Whatever brilliant metallurgical discoveries may still be made, this white metal will not be able to be replaced for a long time, if ever.—*The Ironmonger.*

## Erratum.

### Salt Water Gilding Formula.

In THE BRASS WORLD, June 1913, the use of Trisalyt for salt-water gilding was described. In the formulas given, the amount of water stated should have been 5 gallons instead of 1 gallon. The formulas for the salt-water gilding, both the ordinary formula and that containing Trisalyt should be as follows:

*Plain Formula.*

| | |
|---|---|
| Water .................... | 5 gallons |
| Yellow Prussiate of Potash.. | 16 oz. |
| Sodium Phosphate .......... | 8 oz. |
| Sodium Sulphite .......... | 4 oz. |
| Sodium Carbonate .......... | 2 oz. |
| Gold .................... | 6 pennyweights |

The gold is "cut" with aqua-regia and converted into fulminate before dissolving.

*Trisalyt Formula*

| | |
|---|---|
| Water .................... | 5 gallons |
| Yellow Prussiate of Potash.. | 6 oz. |
| Sodium Phosphate .......... | 5 oz. |
| Potassium Carbonate ....... | 4 oz. |
| Sodium Sulphite ............ | 3 oz. |
| Sodium Carbonate .......... | 2 oz. |
| Gold Trisalyt ............... | ½ oz. |

In the Trisalyt formula the ingredients are dissolved together in the water and the bath is ready for use.

Much of the difficulty experienced in nickel plating is caused by the use of too few anodes so that the bath gradually becomes exhausted of nickel and contains an excess of sulphuric acid.

## Coloring Copper Brown.

According to an article by E. Groschuff in a recent issue of *Deutsche Mechanische Zeitung*, copper, either solid or a copper deposit, may be colored brown by the following solution:

| | |
|---|---|
| Water .................... | 1 gallon |
| Sodium Chlorate .......... | 12 oz. |
| Ammonium Nitrate ........ | 12 oz. |
| Copper Nitrate .......... | 1½ oz. |

The solution is used hot, practically boiling, and the article allowed to remain in the solution for about 10 minutes. The copper nitrate should be neutral.

It is stated that passive copper or that which has been boiled in a sodium hydroxide solution will not take the color in the solution. Tin, zinc and lead are dissolved by the solution and aluminum becomes coated with a film of oxide. If these metals are present on the article to be colored, along with the copper, it will not take the brown color.

## Elianite.

In connection with the corrosion of iron, it is worth mentioning that chemists have long recognized that pure metals are far more resistant to acids than metal containing small quantities of impurity, galvanic action being easily set up in the latter case. Consequently the fact is of interest that alloys are now being prepared which resist acids to a very great extent, and one such, prepared by Dr. Rossi, which is of moderate price, is described in the Italian technical papers. The composition of the new alloy, which has been called *elianite*, is not given, and it is stated that chemical analysis does not allow of the determination of the way in which the constituents are combined. Elianite is prepared in the electric furnace, and scientific supervision is essential if a metal with absolute resistance to acids is to be obtained. The material differs from most of the resistant alloys which have been hitherto prepared, in that its resistance is general and not limited to certain acids. It is not attacked by chlorine or bromine in a free condition, by hydrochloric, sulphuric, or nitric acids, or by aqua regia made up of three parts of hydrochloric acid to one of nitric acid. Copper is not precipitated either from acid or alkaline solutions, and it is not altered by immersion in sulphur in a state of combustion. The tests to which the alloy has been subjected appear to have been very stringent, its percentage loss in weight being determined after boiling with certain corrosive agents for twenty-four hours. The tests were then repeated for two successive periods of twenty-four hours, at the end of each of which the loss in weight was again determined. The maximum loss of weight observed was after the first twenty-four hours' boiling with sulphuric acid of 98 per cent. strength; in this case the loss was 0.10 per cent., but during the two succeeding periods of twenty-four hours the loss only amounted to 0.02 per cent. each day.

Whilst cast iron has a specific gravity of 7.3, that of elianite is 6.8; the respective melting-points are 1,250° C. for elianite. Elianite is a good conductor of heat, whilst its resistance to corrosion is 1,000 times that of cast iron. Its hardness is 1.6 times that of cast iron.—*The Ironmonger.*

## Correspondence.

*[illegible]*

### Graphite Galvanizing Kettles.

*Editor:*

In the May issue of The Brass World, page 168, appears a very interesting article on the failure of graphite galvanizing kettles. The chief objection to the graphite kettle seems to have been its short life, due to the burning of the graphite, or when the kettle was later protected from this burning action, by being immersed in a bath of molten lead contained in an outer kettle, the breakage and deterioration were such that the graphite kettle has been abandoned.

Can you tell us whether there has ever been used for this purpose, the regular iron kettle, fitted with a lining made from blocks of solid, pure graphite, cut to shape? Acheson-graphite slabs and plates in practically any sizes can be readily machined and cut to form such a lining. They are solid graphite, containing no bond whatever. In fact, they average well above 99 per-cent pure graphite carbon. It may be that this material would also deteriorate too rapidly to make its use economical, yet the idea naturally suggests itself, and if you will give your opinion on it, we will appreciate it.

*International Acheson Graphite Company.*
*Niagara Falls,*
*May 22, 1918. N. Y.*

## Plating Baskets.

Plating baskets are very necessary appliances in the electroplating trade and form the means which we have of treating small articles that either cannot be strung on wires or held on racks, or which will not allow treating in this manner. By means of baskets it is possible to electroplate the smallest article and cheaply too. Take such goods as buttons, eyelets, glove fasteners etc., which not only must be plated cheaply, but which supply no means for holding them. A plating barrel, of course, can be used, but in many establishments the amount of work had is insufficient to allow this appliance to be employed. Resort must then be had to baskets.

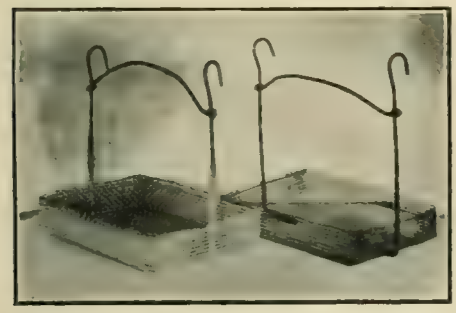

Fig. 1. Plating Baskets Made of Wire Netting.

Various kinds of baskets are used for electroplating small articles and they may be of varying sizes. It is not advantageous, however to use them too large as it then becomes difficult to manipulate the work readily. They should be small enough so that, when filled with work, they may be handled readily as the goods in them require shaking from time to time to prevent bare places being left when one piece touches another. By shaking, from time to time, these portions are exposed and plating follows regularly.

A good form of basket is that shown in Fig. 1. It is made of wire netting, either iron, copper or brass may be used, depending upon the character of the solution used. The ends are bent up and fastened either by soldering or by small pieces of wire or rivets. The hooks, which form the connection, should be soldered to the basket in order to supply a good source of the current and which will not be interrupted by imperfect joints. The tops of these rods which terminate in the hooks should be reinforced by another rod between them so that the whole basket may be stiffened. These rods may be of brass or copper, or if the occasion requires, of iron.

The objection to the use of these "all metal" plating baskets is that they become coated with a deposit, which, of course, increases each time they are used and necessitates, sooner or later, either stripping the basket or selling it for scrap. The latter method is the one more generally used and results in not only a considable loss in the metal itself, but in the basket. Otherwise this form of basket is to be preferred to all others as it forms the ideal metal of conducting the current to the work being plated in the basket.

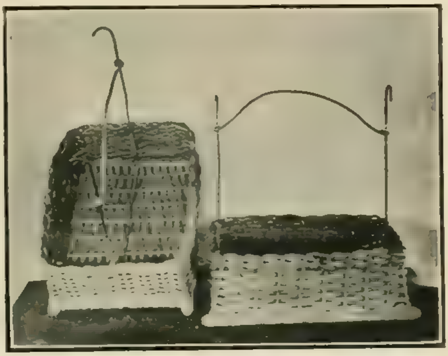

Fig. 2. Plating Baskets Made of Willow.

Another form of plating basket frequently used is one made of wood, except the bottom which consists of wire cloth or netting nailed to the wood sides. This is a cheaper and quite satisfactory form. It has nearly all the advantages of the "all wire" basket. It can be cheaply made and when the wire in the bottom becomes coated with metal so that the basket

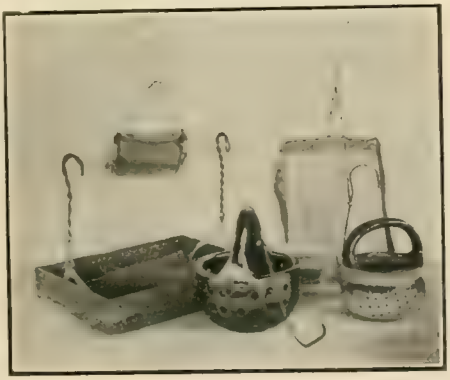

Fig. 3. Various Kinds of Plating Baskets and Those Made from Dipping Baskets.

cannot longer be used, the cloth or netting may be stripped off from the wood strips and a new piece nailed on. Copper nails should be used for this purpose as they will be found the best. They will not rust while the basket is not in use.

A very serviceable form of basket for some classes of work can be made out of a common willow basket to be purchased very cheaply and intended for household purposes. This form of basket is shown in Fig. 2, and is connected by rods of heavy wire extending down into the basket and forming the connection between the work and the cathode or work rod. For some classes of work this basket will be found admirable as it will not [illegible] and there is nothing to renew but the conducting rods. It should be reinforced at the top by the wire or rod across the conducting rods as shown in the illustration.

Dip baskets may also be used for plating baskets, when the [illegible] and [illegible] the work [illegible] will not pass through the holes in the basket itself. Conducting wires will have to be used as in the other baskets shown in Fig. 2 and which extend down to the work. The basket itself may be hung from the work rod in the tank by a hook. These baskets are shown in Fig. 3.

In the use of plating baskets, they should not be filled so full that the work cannot be moved by shaking. The amount that can be advantageously treated can easily be ascertained by a trial.

## New Alloy for Uniting Glass, Porcelain, Etc.

A new alloy for uniting glass, porcelain, stoneware, etc., has been patented in England by A. Spichten and R. Knoebel of Basel, Switzerland.

It consists of the following metals:

| | |
|---|---|
| Lead | 10 parts |
| Tin | 5 parts |
| Bismuth | 3 parts |

It is stated that the alloy melts at 170°C. and it is to be applied in the fluid state to the glass or other material it is desired to solder.

Lead pipe is rarely pure lead and contains considerable antimony and frequently some tin. Much of the lead pipe manufactured is made from scrap, hence the presence of antimony and tin.

## Cause of Blackening of Carbonate of Copper in Making Up a Copper Plating Solution.

In making up a copper plating solution by dissolving carbonate of copper in cyanide, the carbonate frequently will turn black and refuse to dissolve or dissolve extremely slowly. When this is the case, the solution is apt to become abnormal on account of the fact that the cyanide does not become saturated with the carbonate.

The cause of the formation of this black copper compound is the fact that the solution becomes too hot while the dissolving is taking place. Chemical action is followed by the production of heat, and when carbonate of copper is dissolved in cyanide, heat is generated. If the solution is already hot when the action begins then the heat generated is often sufficient to cause the formation of this black copper compound. If the solution is heated while the [illegible] the black compound [illegible]. [illegible] temperature at which this black compound [illegible] determined. It apparently lies around 175° F.

The black compound is [illegible] solution with considerable difficulty.

In making up a cyanide copper solution, therefore, it is necessary to keep the temperature down so that the solution does not become overheated. It is advisable to start with the cyanide solution in water cold or slightly warm. The action of the cyanide on the carbonate of copper will then heat the solution to a sufficient degree to cause the dissolving to take place rapidly and without the formation of any black oxide of copper. If the cyanide solution is heated before the carbonate is introduced, the heat generated is frequently sufficient to cause the black compound to form and produce abnormal results.

While charcoal should be invariably used in melting brass and bronze, it is not only useless in melting aluminum, but dangerous. Aluminum is so light that the charcoal is apt to become intermingled with it and the castings made from it will have small specks and pieces in them.

## Pressed Steel Pots for Melting Aluminum or Soft Metals.

Soft metals are melted in iron pots and they are usually of round shape like an ordinary kettle. On this account it has always been necessary to make them of cast iron and such cast-iron pots are a standard article in the babbitt-metal and solder trades.

A new article in the shape of a pressed steel pot has recently made its appearance on the market and is being manufactured for the trade by the Eclipse Fuel Engineering Co. of Rockford, Ill. An assortment of these pressed steel pots is herewith shown. The advantage of such pots will at once be appreciated by those who are familiar with the difficulties encountered in the use of the regular cast-iron pot.

The advantage of the pressed steel pot lies in the fact that it will not break by heat and that metal will melt much more rapidly in them. The quantity of metal which can be melted in them is greater for a given outside diameter than with a cast-iron pot on account of the less thickness. The specific heat of iron is about four times that of lead which means that it takes four times as much heat to heat iron to a given temperature as it does lead. Therefore, a thin pot, when used for melting, means more rapid work.

The cheapness of the pots is greatly in their favor and while for such metals as zinc or aluminum, which attack iron or steel, they will, of course, be destroyed more rapidly than a thick cast-iron one, a new pot can be installed and still have the cost less. For lead hardening, it has been found that a steel pot one-eighth of an inch in thickness will last for six months.

For melting solder or babbitt-metals which do not attack iron readily, the life of a pressed steel pot will be long.

For melting all kinds of soft metals, aluminum and for lead hardening the pressed steel pots will be found very serviceable. For cyanide hardening they will also be satisfactory and are used for this purpose with excellent results.

The pots are made from ¼ in. in thickness upwards, depending upon the size, and are made in a large variety of sizes from a diameter of 4 inches and a depth of 10 inches up large sizes. Both flat and round bottom pots are made and special sizes are made to order.

One of the uses for which the steel pots will be found of value is in electroplating shops for holding potash or soda solutions.

**Pressed Steel Pots Used for Melting Soft Metals, Cyanide Hardening, Potash and Soap Kettles.**

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The peasant class of Russia, which, it is stated, forms 77 per cent. of the total population, still uses the wooden spoon. They cannot afford even steel or tinned spoons and never have plated ware. It is stated that only about 10 per cent. of the population use plated or silverware. Most of the plated ware used in Russia is manufactured in Warsaw, Poland. Only the wealthy classes use sterling silver.

## A Swiss Method of Burnishing Silver Plated Hollow-Ware by Steel Balls.

A method has recently been patented* in the United States by Jean Uebersax of the firm of Wenger and Co. of Delemont, Switzerland, for burnishing silver plated hollow-ware by means of steel balls. While the use of steel balls offers nothing new, the process differs from the ordinary method in that it allows only the balls to move and the work practically remains stationary.

The operation of the process requires a special form of barrel which is really the essential feature of the patent. It may be understood from the sketch accompanying this article. The barrel is made of wood and is of hexagonal shape. It is preferably operated by a motor, although any desired method may be used. Variable speeds are necessary, however, and this can be accomplished by any desired means, such as cone pulleys or, if a motor is used, by a suitable rheostat. Underneath the barrels (two are used on one stand) are situated two hoppers into which the contents of the barrels are dumped after the burnishing operation has been completed. This serves to separate the balls from the article being treated. The barrels themselves are made to split in the middle to allow charging and emptying readily, and a clamp holds these two parts together while the barrel is in operation.

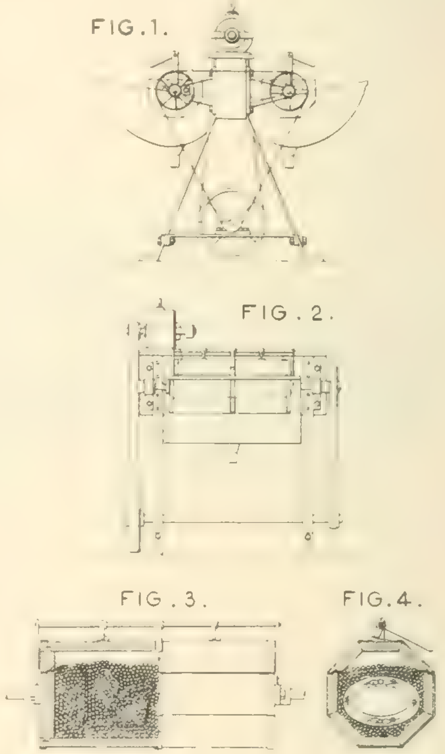
A novel feature of the process, and one which, as far as known, is quite new, is in the use of *steel pins* in conjunction with the steel balls. The use of these steel pins, it is believed, is new in the United States and their value apparently lies in reaching portions of the surface of the article to be burnished which would not be touched by the balls. These pins are apparently rounded and given a surface like the balls.

The inventor gives the following directions for operating the barrel upon silver plated goods:

"Suppose one drum of the apparatus to be, for example, 32 inches in length and its parallel faces to be 20 inches apart; the silver utensils to be burnished are introduced into the drum with from 5 to 10 quarts of water in which about an ounce or two of a suitable soap has been dissolved. As many steel balls of from ½ to ⅛ in. in diameter and steel pins of from 1/16 to ⅛ in. in diameter as are necessary to fill the drum and completely cover the silver plated article. The proportion of steel balls and pins used is 130 lbs. of steel pins to 250 lbs. of balls. That is for the size barrel previously mentioned.

The two drums of the apparatus having thus been charged, they are caused to turn for the required time in order to effect the polishing of the silver utensils under the combined action of the steel balls and pins, and from the soapy water on the said articles. After the rotation has been finished, the drums are opened by separating the parts by releasing the clamp and the contents are dumped into the trough underneath. The soapy water then flows out through the outlet in the bottom.

During the rotation of the drum, the silver utensils, which are liable to get out of shape, will remain always fully enveloped by the steel balls and pins, and as these balls and pins are



Method of Burnishing Silver Plated Hollow-Ware by Steel Balls and Pins.

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*U. S. Patent, 1,063,478, June 3, 1913.

much more mobile than the said utensils, the latter will never become much displaced in the radial direction within the said drum during the rotation of the latter, and will consequently not be subjected to deformation. The utensils have such a relation to the polishing mass in specific gravity as to be kept approximately central of the drum in its rotation, and will neither fall to the bottom or rise to the top during the rotation of the drum. Hence they are kept from contact with the walls of the drum and prevented from being deformed in any way. The speed of rotation varies according to the character of the article; that is, a perfectly round article would still remain central whether the speed be high or low, but an article having projections, such as a water pitcher or the like, would be dislodged from an absolutely central position due to the irregular action upon the projecting parts. The speed, therefore, is adjusted to suit the article being treated."

Among the articles which can be burnished in this manner, the patentee states that teapots, plates, coffee pots, pitchers, etc., may all be tumbled in the manner previously described.

## A Flux for Use in Coating Iron or Steel with Lead.

A flux for coating iron or steel with lead by the hot process (dipping) has been patented by Samuel Edwards of Pittsburgh, Pa. It consists of the following:

—A—

| | |
|---|---|
| Muriatic Acid | 100 ℔s. |
| Zinc | 2½ ℔s. |

—B—

| | |
|---|---|
| Muriatic Acid | 100 ℔s. |
| Aluminum | 1 ℔. |
| Sal-Ammoniac | ½ ℔. |

The zinc and aluminum are dissolved in the acid and, after the sal-ammoniac has been dissolved, the two solutions, A and B, are mixed. This constitutes the flux.

The iron or steel to be coated with lead, is first immersed in the flux, so that the surface is completely coated, and then it is immersed in the molten lead, heated to about 600° F. It is claimed by the patentee that the surface of the iron or steel will be covered with a uniform and adherent coating of lead.

## The "Stock" Zinc Solution for Use in Brass Plating.

The best method of using a brass plating solution is by means of copper anodes, and is now extensively employed in a large number of establishments in which the electrodeposition of brass is carried out. The advantage of copper anodes is that they feed the solution with copper in a continuous manner and any copper in the form of carbonate is very rarely necessary. All that is required, therefore, to maintain the solution in a normal condition is carbonate of zinc. The use of copper anodes, accordingly, greatly simplifies brass plating and renders the maintenance of the solution quite easy.

As the copper anodes feed the solution as far as the copper is concerned, the color of the brass deposit will always indicate whether any zinc is required. If the deposit begins to redden or go to a bronze color, then more zinc is necessary to bring it back to a yellow color, and all that is required is to add zinc. No copper is required.

The most important feature of a brass plating solution is the free cyanide. The relative proportion of the copper and zinc in the deposit is easily ascertained by the color and this part of the operation is such that no difficulty need be had in maintaining a uniform condition from day to day. The free cyanide, however, is not as easy and when once it is obtained in the desired amount, it should not be disturbed. On account of this uniform quantity of free cyanide that is necessary in a brass plating solution, the addition of carbonate of zinc directly to it cannot be carried out for the reason that, when introduced, the carbonate will neutralize some of the free cyanide and reduce the quantity present in a corresponding amount. The introduction of the carbonate of zinc directly to the brass solution, therefore, will reduce the amount of free cyanide in it and produce abnormal results. Suppose, for example, we have a brass solution containing 4 oz. of free cyanide to each gallon and there is added enough carbonate of zinc to it to neutralize 2 oz. of the free cyanide. Then the amount of free cyanide, of course, is reduced to 2 oz. per gallon which is not sufficient to keep the anodes clean and the solution will plate irregularly. The way to add the zinc, so as to prevent any change in the amount of free cyanide, is by means of a stock zinc solution.

### *The Stock Zinc Solution.*

The stock zinc solution consists of a solution of cyanide in water and to which has been added all the carbonate of zinc it will take up, but no more. In other words, a saturated solution of carbonate of zinc in cyanide. In this manner, on account of its containing no free cyanide, it is possible to add it directly to the brass solution without disturbing the free cyanide at all.

Make the stock zinc solution as follows:

| | |
|---|---|
| Water . . . . . | 1 gallon |
| Cyanide | 2 lbs. |

Dissolve in it all the carbonate of zinc it will take up (dissolve when cold or slightly warm) It is well to have a very slight amount remain in the bottom of the vessel undissolved as this will indicate that the solution will take up no more. The solution, therefore, is strong and contains no free cyanide. It may be preserved for addition to the brass solution when it is desired to add zinc, and the free cyanide in the brass solution will not be disturbed at all.

The use of this "stock" zinc solution greatly simplifies the maintenance of a brass plating solution and renders it impossible to disturb the free cyanide in it. It is possible, therefore, to maintain it from day to day without change, and when the color of the deposit indicates that more zinc is necessary, then a little of the stock zinc solution can be added and still have the free cyanide, that most important feature of a brass bath, remain constant. The maintenance of the free cyanide in a constant condition, means that uniform results will always be obtained.

Certain metals and alloys prepared in the electric furnace, which sometimes resist the most energetic chemical action, are readily attacked and completely dissolved when powdered and heated with an excess of phosphoric acid above 1.75 in density. This applies to metallic silicon, zirconium, tungsten, ferro titanium, vanadium, silico-manganese, titanium nitride, the alloy of ferrosilicon with 23 per cent. aluminum, boron-nickel, and carborundum. In all these reactions the carbon contained in the alloys remains, wholly or partially, in a flocculent condition in the syrupy liquid.

## Utilization of Waste Heat for Power Generation.

The utilization of waste heat from various sources has been given considerable attention of late and attempts have been made to turn it to a profitable account. While it is possible, as far as a large furnace installation is concerned, it has usually been considered unprofitable when small quantities are considered. The following extract from the *Daily Consular Report* will indicate that the subject is receiving considerable attention in England:

"West Hartlepool, (England) which can claim to be the first municipal authority to produce electricity by means of waste heat, will open its new generating station in the course of two or three weeks. The two turbo generators, each of 1,500 kilowatts, will be driven by exhaust steam from the furnace-blowing engines of the Seaton Carew Iron Co., adjacent to whose works the station is built. In return for their exhaust steam, which has hitherto been blowing to waste in the air, the Seaton Carew Iron Co. will receive free from the corporation the supply of electric current they need at their works.

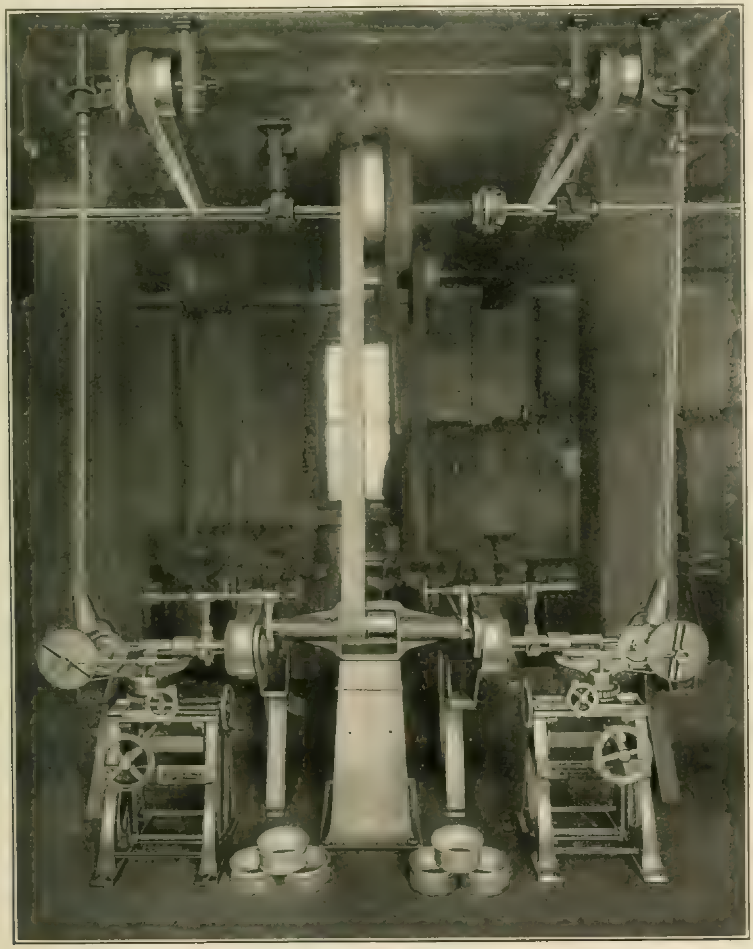
Expenditure on coal will practically be eliminated. The coal bill for the present electricity station is about $20,000 a year, and, as it is anticipated that the consumption of current will largely increase under the cheaper rate now possible, the ultimate saving by the use of waste heat will be very considerable. Should the supply of exhaust steam not be available, either through a breakdown of the blowing engines or through the iron works being idle, a supply of high-pressure steam will be obtainable from the Seaton Carew Iron Co.

The total expenditure involved in connection with the new scheme is $188,500, the plant alone having cost $150,000. The old generating station will be maintained as a stand-by, and also as a town sub-station. There the current from the new station will be transformed to the voltage required for distribution to the town."

When metals are melted with yellow prussiate of potash as a flux, iron is taken up from it. The yellow prussiate contains iron and when the metal absorbs it, it becomes chemically combined and the metal hardened.

## The Automatic Buffing of Metal Goods.

There are many concerns, manufacturing metal goods, which have the same class of work from day to day. It is quite natural to suppose that automatic machines can be devised that will take care of such work. In jobbing shops, where the work varies from day to day, and is of great variety, automatic machines would not pay to install; but for manufacturers who make metal goods in large quantities, a machine which will take the place of hand buffing will be found an exceptionally profitable investment.



Double Automatic Buffing Machine at the Aldrich Works, Buffalo, N. Y.

A machine is now being manufactured by the Automatic Buffing Machine Company, 57 Indiana St., Buffalo, N. Y. which has already filled the gap so long desired in manufacturing goods which must be buffed. This machine allows unskilled labor to be used in buffing and with the result that superior work is turned out. The goods to be buffed are placed on a chuck and fed up to the buff wheels. The machine does the rest.

In the illustration, herewith shown, a double machine is given. This machine uses two wheels. One may be used for cutting down the work and the other for "coloring". The machines, as will be noticed are free from complications and may be easily manipulated without getting out of order.

Many classes of goods can be buffed on the machines. Some of them are automobile and carriage lamps, cuspidors, gongs, bedstead trimmings, clock cases, door knobs, cycle hubs, fishing reels, lamps and lamp parts, plumbers' goods, reflectors, tea pots, tea kettles, lubricators and a large variety of other metal goods.

The value of the machine for general buffing may, therefore, be readily appreciated and manufacturers who have used the machines have been able to reduce their costs to a low figure.

## Production of Cobalt and Silver in Canada.

In a recent report on the Chemical Industries of Canada by Dr. S. Dushman and J. W. Bain, some interesting data on the production of metallic cobalt and silver in Canada is given. They say:

"The total silver production of the Dominion for 1911, is estimated at 32,740,748 oz., valued at $17,452,128, of which 30,761,690 oz. were from Ontario 1,910,323 oz. from British Columbia, 50,300 from the Yukon and 18,435 from Quebec. Since the discovery of the deposits at Cobalt, Ontario, in 1904, Canada now ranks thirds among the silver producing countries of the world.

Ores from the Cobalt district are at present treated at three metallurgical works. Silver bullion of fineness varying from 850 to 998,2 is produced at the works, other products being white arsenic and in the case of the Coniagas plant, nickel and cobalt oxides. During 1910 these three works combined treated 9,466 tons of ore and concentrates, the silver recovered amounted to 14,574,837 oz. The remainder of the output, consisting of 24,893 tons of ore and concentrates, yielding 16,076,580 oz. of silver, was mainly exported to the United States. The material sent abroad for treatment contained on an average 645 oz. per ton, while that refined at home had an average of 1,539 oz. per ton.

The ores of the Cobalt district are extremely complex and the problem of treating so as to extract economically the silver, cobalt, nickel and arsenic still awaits solution. Some idea of the extent of this over-production of both this cobalt and arsenic may be gathered from the fact that the ore contains on the average:

| | |
|---|---|
| Cobalt | 6.76% |
| Nickel | 3.72% |
| Arsenic | 30.00% |

The demand for cobalt and arsenic does not keep pace with the amount produced as a by-product during the extraction of the silver. One year's production of the Cobalt mines produces ore enough to meet the present consumption of cobalt oxide for several years. The cobalt oxide, mixed with nickel oxide, is exported to Europe for use in the manufacture of pottery and china wares. The quantity of oxide is believed not to exceed 300 to 350 tons per annum, which is much below the equivalent of ore produced by the silver mines of Cobalt.

Attempts have been made to find an application of cobalt as a constituent of alloys, and a recent report mentions an alloy of chromium with cobalt as possessing valuable properties. According to this report, an alloy of 25 per cent. chromium and 75 per cent. cobalt is superior to steel for knife blades and is very resistant to corrosion, and takes an edge comparable to steel. As regards resistance to corrosion, it is equalled only by gold and metals of the platinum group. Its use in the chemical and physical laboratory in place of platinum has been suggested. It may, therefore, be that in this or similar directions an outlet will be found for the excess of cobalt."

Zinc is the best protection for iron and steel from rust. Even a very light coating of zinc will act as a good preventitive, and a heavy one is exceptionally satisfactory.

American Minister John B. Jackson, at Bucharest, Roumania, reports that the lowest bid for minting silver coins for the Bulgarian Government was that of the Peter Ungarischen Kommerzialbank, and the contract is to be awarded to that institution, which will have the minting done in the Hungarian mint at Kremnitz. The bid for minting 6,000,000 francs was 2,813,000 francs. The contract for minting nickel coins of the nominal value of 4,000,000 francs is said to have been given to the Krupp firm at Berndorf

# The Scrap Metal Business in the United States.

The U. S. Geological Survey, in a recently issued Bulletin No. 117, published an article entitled "Our Enormous Junk Heap" in which a general *resumé* of the scrap metal business for the year 1912 is given. The following is the article in full:

The value of the ““secondary metals,” exclusive of gold, silver, platinum, iron and aluminum, recovered in 1912 reached the enormous total of $77,395,843, compared with $52,585,390 in 1911, according to J. P. Dunlop, of the United States Geological Survey, an increase of nearly $25,000,000.

““Secondary metals” are those recovered from scrap metal, sweepings, skimmings, drosses, etc., and are so called to distinguish them from the metals derived from ore, which are termed ““primary metals.” The United States Geological Survey's figures showing the recovery of secondary copper, lead, zinc, tin, and antimony are summarized in the table below. The reports to the Survey do not include the very large quantity of old iron and steel remelted, neither do they include the precious metals. The quantity of aluminum scrap returned to secondary smelters is increasing rapidly, owing largely to the rise of the automobile, and the Survey reports next year will probably include ““secondary aluminum."

The values given for the secondary metals are arbitrary and are based on the approximate average value of the primary metal for the year. While junk dealers and collectors frequently pay low prices for small quantities of scrap metals, competition results in good prices being obtained for carefully sorted scrap and other waste metal products sold in large quantities. After remelting or refining, the metals are sold at only slightly lower prices than new metals. These secondary metals displace an equivalent quantity of primary metals and must be considered in any estimate of stocks available for consumption in any year. For a few special purposes requiring especial purity of materials, it is necessary to employ primary or virgin pig metal, but as a general rule secondary metals can be used in whole or in part. In fact most foundries, in order to compete for business successfully, must use secondary material at least in part, and hence scrap metal is purchased by them and remelted with primary pig metal or with composition ingot. The secondary smelters, by handling large quantities of all kinds of scrap, are able to classify their material so as to produce continuously alloy metals of uniform composition suitable for use in work of different classes. Such composition ingots are being purchased and used in increasing quantities by many foundries and other manufacturers in place of primary metals or mixtures of new and scrap metals. The higher prices prevailing in 1912 for all metals other than lead had the effect of causing more than a normally increased demand for and recovery of metals from scraps, drosses, etc.

It has so far proved impossible to separate the statistics for secondary metal recovered from clean scrap made in the ordinary course of manufacture from the statistics of metal recovered from drosses and ashes and from scrap or old metal that had entered the trade as manufactured articles and been discarded. An estimate has been made of the clean copper and brass scrap, but no distinction is made by many of the dealers or smelters.

### *Conservation That Pays.*

There was a notable increase in the use of magnetic separators to obtain scrap free from iron filings, and at some plants concentrating tables were introduced by means of which cinders and molding sand from brass foundries containing as little as 2 per cent of metal were treated successfully. The general tendency is to save all waste metal of every kind and obtain more for it by better grading and classification. Copper wire and heavy copper and brass scrap are kept separated from light copper and brass, and small scrap is briquetted to replace the loss in remelting. Few metallic articles are wasted; old clocks, bases of electric lamps, light wire, and springs are all gathered and sold, though such articles are not desirable scrap and have a limited market compared to heavy copper, brass, babbitt, etc. It is impracticable to segregate the refining, remelting, and reuse of secondary metals according to States, but over 90 per cent of the refining and smelting of drosses and scrap metals in the United States is confined to the territory east of St. Louis and north of the Ohio River. Reports were made by approximately 500 users of secondary material, of which about 150 were in Pennsylvania and west Virginia, 120 in New York, New Jersey, Connecticut, Maryland, and Massachusetts, and about 100 in Ohio, Indiana, Illinois, and Michigan. Some of the largest plants that remelt or refine secondary metals are at Philadelphia, Chicago, New York City, Pittsburgh, Detroit, and St Louis, and at Tottenville, N. Y., and Rome, N. Y.

The total amount of secondary copper remelted had an average copper content of 70 covered, on the assumption that the brass reper cent, was 137,507 tons, of which 14,541 tons were recovered by plants refining primary metals and the remainder by plants treating only secondary materials. The copper produced by smelters of the latter class includes 42,623 tons of pig copper, 9,277 tons of copper in alloys other than brass, and 71,066 tons of copper in remelted brass. At least 37,500 tons were recovered from clean scrap made in the course of manufacture of copper and brass ware, so that only about 107,000 tons was obtained from ashes, cinders, and scrap, or from material that had actually been used and discarded. The value of the copper, both as metal and in alloys, is computed at the average yearly price quoted for casting copper by the "American Metal Market." According to the Bureau of Foreign and Domestic Commerce, the exports of scrap brass fit only for remanufacture, for the calendar year 1912, were 4,435 tons, and the imports were 3,298 tons. While many railways sell or turn in their brass and copper scrap to dealers in part payment for new material, the reports received show that the railways utilized in their own shops and foundries over 12,900 tons of brass, in addition to 1,557 tons of copper, and 1,813 tons of copper in alloys other than brass

The production of copper from secondary sources in 1912 was equal to 17.5 per cent. of the smelter output of primary copper in the United States from all sources, or 22.3 per cent. of the primary copper smelted from domestic ores.

### *Large Increase in Lead Recovery*

The secondary lead recovered amounted to 67,168 tons, or about 13,000 tons more than in 1910. The secondary lead recovered as pig lead increased about 3,000 tons, a normal increase in view of the fact that the average lead price was the same in 1911 and 1912. The recovery of lead in alloys was very large, increasing over 10,000 tons compared with 1911. This abnormal increase was mainly the result of the prevailing high prices for the other metals in the alloys and of the extension in manufacturing and in transportation, which occasioned a more extensive use of remelted babbitt and bearing metals. Other important sources of secondary lead were old pipe, lead linings of acid tanks, and drosses from white-metal alloys. Regular smelters reported the recovery of 7,385 tons of lead from lead and antimonial lead scrap. The total output of secondary lead was equal to 13.3 per cent. of the refined lead produced in the United States in 1912, compared with 11.1 per cent. in 1911, or to 16.7 per cent. of the refined lead produced from domestic ores in 1912. It was exceeded by the domestic output of only two States, Missouri and Idaho.

### *Increase in Secondary Zinc and Spelter*

The output of secondary zinc (including that in brass) amounted to 81,543 tons and equaled 24.1 per cent. of the total production of primary spelter in the United States in 1912, compared with 25.1 per cent. in 1911. The zinc recovered in alloys other than brass amounted to 3,912 tons. Of the 52,251 tons of secondary zinc recovered as spelter, 26,064 tons were obtained by redistillation from drosses, skimmings, etc. In addition to the large quantity of spelter recovered, several thousand tons of zinc chloride were made from drosses, skimmings, etc., and likewise several thousand tons of the zinc pigment, lithopone.

The quantity of spelter recovered by redistilling drosses, skimmings, etc., increased about 7,800 tons. Two zinc smelters in the Eastern States which recover spelter entirely from drosses, skimmings, etc., used large 800 or 1,000 pound retorts instead of the small ones used by smelters treating ore or mixed ore and drosses. A large portion of the secondary spelter recovered was reported to be of high grade, ranging above 99 per cent. pure and equal in practically every respect to the spelter made from ore. Domestic spelter prices were too high during most of 1912 to permit the profitable export of zinc dross, so that the exports declined from 4,246 tons in 1911 to 205 tons in 1912.

The production of secondary antimony, of which all but 13 tons was recovered in alloys, increased from 2,369 short tons in 1911 to 2,506 tons in 1912. The value given is arbitrary and is based on the average yearly price for Cookson's antimony given by the "American Metal Market." No antimony ores of domestic origin were smelted in 1912, but the total for the year includes 135 tons of antimony contained in antimonial lead scrap recovered by regular smelters. The principal materials refined or remelted which contained antimony as an alloy were hard lead drosses; babbitt, solder, pewter, and type metal. The 1912 imports of antimony as metal, in ore, or oxide amounted to 8,685 tons, and the recovery from secondary sources was equal to 29 per cent. of such imports. The secondary recoveries of antimony were double those of the antimony content of antimonial lead ores of domestic origin smelted in 1912.

**Production of Secondary Metals in the United States in 1911 and 1912.**

| Metal. | 1911 |  | Metal. | 1912 |  |
|---|---|---|---|---|---|
|  | Short tons. | Value |  | Short tons. | Value |
| Secondary copper, including that in alloys other than brass...... | 50,845 | $12,711,250 | Secondary copper, including that in alloys other than brass.... | 66,441 | $21,593,325 |
| Remelted brass ........ .. ...... | 80,370 | 16,814,400 | Remelted brass .................. | 101,523 | 27,279,516 |
| Secondary lead......... . ..... | 27,359 | 4,882,860 | Secondary lead.................... | 30,266 | 6,045,120 |
| Recovered lead in alloys.......... | 26,895 |  | Recovered lead in alloys........ | 36,902 |  |
| Secondary spelter .. . . ..... | 44,714 | 5,464,800 | Secondary spelter ... ...... .. | 52,251 | 7,750,494 |
| Recovered zinc in alloys other than brass .................... | 3,223 |  | Recovered zinc in alloys other than brass ...................... | 3,912 |  |
| Secondary tin . . .. ... ....... | 7,749 | 12,353,040 | Secondary tin ...................... | 8,333 | 14,301,368 |
| Recovered tin in alloys..... ...... | 6,957 |  | Recovered tin in alloys .......... | 7,068 |  |
| Secondary antimony .............. | 10 | 359,040 | Secondary antimony ............. | 13 | 426,020 |
| Recovered antimony in alloys..... | 2,359 |  | Recovered antimony in alloys.... | 2,493 |  |
| Total value... ........ .. .... .. |  | $52,585,390 | Total value...... ..... ... . |  | $77,395,843 |

### *Recovery of Old Tin Important Factor in Supply.*

There were no domestic tin ores smelted in the United States in 1912, though some tin concentrates were shipped from Alaska to Great Britain for treatment and a small quantity of foreign tin ore was smelted in New York. This condition makes secondary tin an important factor in supplying domestic consumption. The secondary tin recovered in 1912 was equal to 26.6 per cent. of the tin, as metal or as oxide imported into the United States during the year. Secondary tin recoveries increased from 14,706 short tons, valued at $12,353,040, in 1911, to 15,401 tons, valued at $14,301,368, in 1912. The quantity recovered as tin was 8,333 tons and that in alloys and chemical compounds 7,068 tons. The value of the recovered tin is arbitrary and is based on the yearly average price given by the "American Metal Market."

The recovered tin includes the tin content of products made by several plants from tin scrap. These included some tin oxide, putty powders, etc., but consisted mainly of tin chloride. The production of these compounds is calculated as metal and not separately stated, in order to avoid disclosing confidential information. As the products are made from scrap tin and thus conserve the primary metal, they are properly regarded as recovered tin. Two forms of tin chloride are handled commercially—stannic and stannous salts. Stannic chloride is usually sold either as a water solution, called bi-chloride of tin, or as an anhydrous sirupy liquid, termed tetrachloride of tin, and is used principally in the silk industry. Stannous chloride is sold in the form of crystals and is used in dyeing and calico printing.

Most of the tin oxide, tetrachloride, and other products were made from clean tin-plate clippings or from tin liquors left in dyeing or weighting silks. The dry chloride process was used to recover the tin from the clippings in some places. In others reverberatory furnaces were used to remove the tin coating, and a large quantity of tin was recovered in the form of a tin powder by the electrolytic treatment of clean scrap, the powder being sent to secondary smelters. The largest recoveries of tin were made from the scruff and drosses that occur in making tin and terne plate, and amounted to over 5,000 tons. The recovery of tin from block tin pipe, tin foil, and old tin cans was relatively small. Only one firm reported using old tin containers from which the tin and solder were first sweated and the black plate remelted to make sash weights. Two years of high prices for tin have failed to bring about any increase in the recovery from used tin cans, and there seems to be no present prospect of any conservation of the large quantity of tin used for tin plate, which now finds it way to the unsightly dump pile.

The principal alloys in which secondary tin was recovered were babbitt and other bearing metals, bronze, solder, pewter, and electrotype metal. The increase of tin in alloys was small, probably because the high price for the metal the last two years has caused the use of less tin in bearing metals and solder.

## The "Coslettizing" Process Upheld in English Courts.

Thomas Watts Coslett of Birmingham, England, the inventor of the well known process of "Coslettizing," which consists of forming a rust-proof coating of a black color on iron or steel by boiling in a solution of phosphoric acid and phosphate or iron, is sending out the following circular to the trade:

"The Comptroller of Patents recently had before him a case in which the Coslett Anti-Rust Syndicate (Lim.) opposed the granting of a patent to Mr. F. R. G. Richards, of the Richards Anti-Rust (Lim.), on the ground that the invention was already covered by the patent of Mr. T. Coslett.

The invention submitted by Mr. Richards consisted in subjecting iron or steel to the action of phosphoric acid and manganse dioxide, whereby a rust-preventing deposit of iron and manganese phosphates was formed thereon. The opposition was based upon the fact that the Coselett patent already covered the use of phosphoric acid and a suitable controlling agent; that the effect of the Richards process was to produce a deposit consisting essentially of phosphate [illegible] which was also the case with the [illegible] Coslett process; and also that in their specification the applications had reclaimed the Coslett invention.

It was admitted by Mr. Gray ,on behalf of the applicants, that the bulk of the coating obtained by the applicants' process was identical with that obtained by their opponents, and also that the manganese dioxide exerted a controlling influence upon the chemical reactions which took place; but he argued that since any soluble body placed in the phosphoric acid solution would have a controlling effect, the applicants, in selecting managanese dioxide for the purpose, had made an inventive step.

Mr. Colefax, for the opponents, argued that the whole of the applicants' process was included within the terms of the Coslett patent, which claimed "a dilute solution of ordinary phosphoric acid with the addition of an appropriate substance or compound adapted to control or regulate the chemical reactions," and on that ground alone the Coslett Syndicate were entitled to at least a specific reference to their patent.

The Comptroller General reserved his decision until May 1, when he decided that the Richards invention was clearly included in the second claim of the Coslett Patent No. 8667 of 1906. He made it a condition that a specific reference to the Coslett patent be inserted in applicant' specification, and awarded costs to the Coslett Anti-Rust Syndicate (Lim.)."

Silver solutions should be filtered occasionally and kept free from dirt and dust. Foreign matter, particularly that which comes from the anodes, settles on the work and causes pits.

Metallic cadmium and lead have nearly the same melting point, as that of cadmium is 609° F. and lead melts at 621° F. Cadmium may readily be melted in an iron ladle.

No substitute for tin has yet been found and the largest use is in the manufacture of tin-plate. This material is simply iron or steel sheets coated with tin, and there is nothing which can take its place. Its value lies in its non-corrosive properties, and any other metal that could be used on iron or steel would not answer for the manufacture of food containers which, by far, constitutes the largest use of tin-plate.

## Activity in Aluminum Production.

There was an increase in domestic production of metallic aluminum in 1912, but the large increase in the domestic consumption given in the table below is chiefly due to the increase in imports.

| Year | Pounds | Year | Pounds | Year | Pounds | Year | Pounds |
|---|---|---|---|---|---|---|---|
| 1883 ..... | 83 | 1891 ..... | 150,000 | 1899 ..... | 6,500,000 | 1907 ..... | 17,152,000 |
| 1884 ..... | 150 | 1892 ..... | 259,885 | 1900 ..... | 7,150,000 | 1908 .... | 11,152,000 |
| 1885 ..... | 283 | 1893 ..... | 333,629 | 1901 ..... | 7,150,000 | 1909 ..... | 34,210,000 |
| 1886 ..... | 3,000 | 1894 ..... | 550,000 | 1902 ..... | 7,300,000 | 1910 ..... | 47,734,000 |
| 1887 ..... | 18,000 | 1895 ..... | 920,000 | 1903 ..... | 7,500,000 | 1911 ..... | 46,125,000 |
| 1888 ..... | 19,000 | 1896 ..... | 1,300,000 | 1904 ..... | 8,600,000 | 1912 ..... | 65,607,000 |
| 1889 ..... | 47,468 | 1897 ..... | 4,000,000 | 1905 ..... | 11,347,000 | | |
| 1890 ..... | 61,281 | 1898 ..... | 5,200,000 | 1906 ..... | 14,910,000 | Total.. | 305,358,779 |

The value of exports of aluminum and of manufactures of aluminum of domestic production for the last five years has been as follows: 1908, $330,092; 1909, $567,375; 1910, $949,215; 1911, $1,158,603; 1912, $1,347,621.

*Expansion of the Aluminum Industry—Prices.*

The Southern Aluminum Co., capital several million dollars, has been organized by an amalgamation of aluminum producers in France, of certain French and Swiss interests, and of certain metal interests in the United States and has acquired a water-power site on Yadkin River, near Whitney, N. C. The company has been developing the property and has plans to erect a large plant for manufacturing metallic aluminum. It is reported that its construction will be under the direction of Paul Heroult.

The projected size of the company and the additional fact that the importation of foreign aluminum is being stimulated by a keen demand promise for the consumers in the United States a sufficient supply of the metal.

The Aluminum Co. of America has secured certain riparian rights in North Carolina and Tennessee and is planning development of the water power for use in an aluminum plant to be constructed at such a point as will insure good freight rates and an adequate labor supply. It is reported that the new aluminum plant will be in operation some time during 1913. In addition to its expansion in the South, the company is building an addition to its plant at Massena, N. Y., which will be one of the largest in the world. It is reported that a large supply of electricity will be conducted from the St. Lawrence at Cedar Rapids to Massena. Plant enlargements at New Kensington, Pa., and East St. Louis, Ill., are also reported.

Little business was reported in the aluminum market at the beginning of 1912. Prices were the same as at the close of 1911, and ranged in early January from 18½ to 19 cents a pound for No. 1 ingot metal in New York. Prices went up in early June to about those established by the convention of the European producers, and quotations rose to 22½ to 23 cents a pound. In early October prices went up sharply and sales were reported at 27 cents, but in December prices eased off to 26 and 26½ cents.

A recently developed branch of the aluminum industry is the manufacture of the powdered metal known to the trade as aluminum-bronze powder and used extensively as a paint pigment, in explosives, in lithographing, and in printing. To make the powder, foil made of the metal only 0.01 millimeter (0.0004 inch) thick is cut into squares of 2 millimeters, or 0.079 inch, on a side and rubbed to a powder. The material feels like powdered graphite and is just as difficult to remove from the skin. Aluminum foil has partly displaced tin foil for wrapping cheese, chocolate, candies, tobacco, etc., and is also used on electrical condensers.

The employment of metallic aluminum for cooking utensils and other articles of domestic use is being extended on a much larger scale in constructing tanks, cooking vats, and vessels for brewers, preserve manufacturers, and in similar industries where heat conduction, non-corrosion, and a non-poisonous nature are essential. Expansion in the use of extruded forms and tubing has been great during the last few years; difficulties have been largely surmounted and they are now turned out with high tensile strength and compact structure in almost any form called for.

The use of aluminum wire as the conductor in long-distance power-transmission schemes is not new, but recent departures bid fair to enlarge this application of aluminum. It is reported that there has been placed on the market a steel-reenforced aluminum cable consisting in all of seven strands. The six outer strands are made of aluminum, and the inner strand is made of steel of high tensile strength. It is claimed for this conductor that it both transmits the current and has the requisite strength for use in the towers which are rapidly displacing poles in transmission lines. The Pacific Light & Power Co., of Los Angeles, has adopted this product for its new transmission line carrying power to Los Angeles, 275 miles.

According to the Mining Journal, London experiments made to bring aluminum to a liquid condition so it may be spread when cold over any dry surface have, according to the German press, beeen crowned with success. The composition is applied like paint with a brush and looks, when spread, like a dull silver coating. It is said to be an excellent preventive of rust, to be resistant to heat, elastic, durable, and resistant to atmospheric influences, and to form an excellent substitute for tin in plating. Metallic aluminum in the manufacture of articles for everyday use has become so common that such articles fail to attract attention as novelties. The demand in this direction seems to be for skilful originality in designing new forms and applications.—*Daily Consular and Trade Report.*

## Diseased Lead.

The curator of the Cluny Museum in Paris recently noticed that oxidation had begun in one of his objects of art wrought in lead, and that it was being slowly converted into a pulverized mass, whereas other specimens under the same conditions remained unaffected.

As the result of investigation, traces of foreign matter—viz., chloride—were found in the affected specimen. This substance, which promotes decomposition, had given rise to the alteration. Professor Matignon ascertained the presence of chloride in all the affected pieces, and even found that the disease could be produced in a sound specimen by scraping it against chloride. The symptoms of this lead disease in a mild form are remarkable. A white speck is seen in the metal, with which others become associated later on. If it is not all completely suppressed, the disease will continue to spread, and "inexorable death" threatens the metal.—*The Ironmonger.*

## A New English, Portable Tilting Furnace.

A new form of crucible melting furnace has been patented by Matthew Harvey of Walsall, England and which is portable. Coke or coal is used for the fuel. The object of the furnace is to supply an appliance that may be moved from place to place and the metal poured directly into the molds.

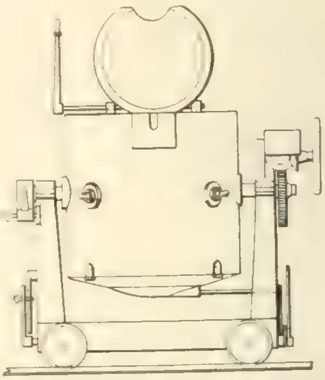


**Fig. 1. Elevation of the Furnace.**

An elevation of the furnace is shown in Fig. 1 and it will be noticed that the body has been placed on wheels intended to run upon a track. The tilting is done by means of the customary hand wheel and worm gear.

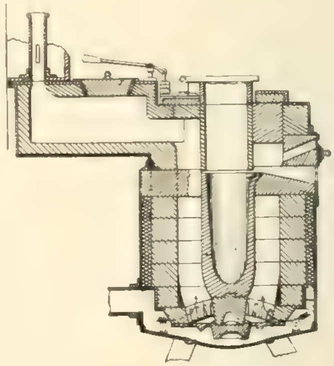


**Fig. 2. Vertical Cross Section.**

In Fig. 2 a cross section of the furnace may be seen. The crucible used is of the high type and is provided with a lip. It is set upon a special block and the blast, necessary for the combustion of the fuel is supplied at the bottom. The charging is done through an opening at the top through which a sleeve is placed.

In Fig. 3, a vertical and horizontal cross-section of the furnace may be seen. The tapered openings through the furnace into the melting chamber are used to regulate the blast and plugs are fitted to them. By removing the plugs, the blast is lessened.

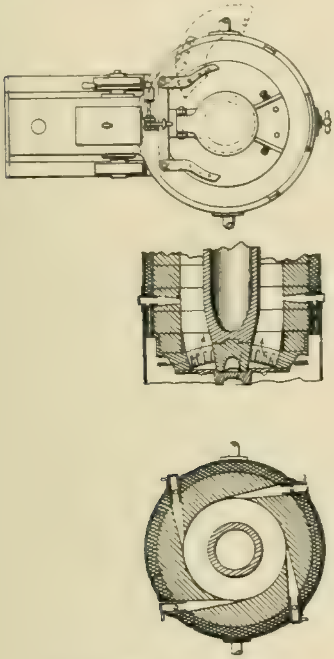


Fig. 3. Other Cross-Sections.

## Preservation of Metals in Marine Construction.

In an article on the preservation of metals in marine construction, F. Lyon in the London *Engineering* makes the following remarks:

The cause of corrosion is considered to be the difference of electrical potential between the metal and the liquid or moisture which wets its surface. Where bronze castings are secured to the steel hull, plates or rings of rolled zinc are very often fastened to the steel in order to prevent the corrosion of the steel because of their higher potential than the steel.

The author discredits this assumption because:

1. Zinc becomes covered quickly with oxide which is electronegative to steel.

2. In no case has a piece of steel connected with a zinc plate corroded less in the same time than a piece of steel cut from the same plate and unconnected with zinc.

3. The steel around the sea-chests of the bottom blow discharges, if properly painted, does not show more corrosion than does that around the other discharges.

4. On many occasions the only steel attacked in the vicinity of the zinc plates was that of the steel screws securing the zincs The use of zinc and other metals electropositive to steel is stated to be a dangerous one and not to be recommended for the following reasons:

*a.* The metal covering must be electropositive to steel, or metal to be protected and, therefore, will dissolve more quickly.

*b.* A covered steel once exposed to the action of the water corrodes rapidly over the exposed surface, and if not stopped by some covering, will pit through before other surfaces are uncovered.

*c.* For hull and ship fittings generally, a surface once exposed cannot be again covered.

*d.* The stable oxides of all metals are lower in potential than the pure metals, and, therefore, the oxide of the coating is at a lower potential and does harm instead of good where the steel is exposed. It is suggested that for the protection of hull construction it is necessary:

1. To provide the most homogeneous metals possible.

2. Paint the complete structure with a complete film of the best anti-corrosive paint, after having cleaned the surfaces from all rust and dried them.

3. Dock frequently and remove any rust. Repaint as may be necessary.

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According to a German periodical, a piece of lead pipe which had lain in the ground for 24 years partly imbedded in cement, showed yearly rings, similar to those found in wood. There were 24 red and 23 yellow rings, which proved to be oxide. There were, therefore, two rings for each year. The part in cement was the one which showed the rings, and that inthe earth showed no alteration. The two colored rings were evidently formed during the dry and the wet seasons, which produced the variation in the oxidation.

# Questions and Answers.

QUESTION No. 1319. We have been experimenting upon the coating of steel sheets with zinc alloyed with a small percentage of aluminum. The difficulty we encounter is that we are unable to melt the aluminum, without burning the zinc, as the melting point of the aluminum is almost 400 degrees higher than that of the zinc. After the zinc has been melted, the aluminum floats on the top in a granulated form which does not permit the sheets to be drawn through the bath and come out smooth. In this connection, we also wish to state that we use a small amount of tin and lead with the zinc. How can the aluminum be alloyed with the zinc?

*Answer.* The best method is to first make a rich alloy of the zinc and aluminum separately and in a small quantity. This is then used to introduce the aluminum in the large batch of zinc. Take the following:

| | |
|---|---|
| Zinc | 9 parts |
| Aluminum | 1 part |

Melt the aluminum (preferably in a graphite crucible, although an iron ladle or pot can be used) and then add the zinc and stir until everything is well melted and alloyed. Pour out into bars and break up for future use. This rich aluminum and zinc alloy can be melted directly with the main body of zinc and 10 times as much of it as there is aluminum to be used will have to be taken. It is put in with the zinc.

QUESTION No 1320. We have recently had an inquiry for a "China-Bronze Finish" from a foreign customer. This is to be put on telephone work. We are not familiar with this finish and would be pleased to have you inform us what it is.

*Answer.* We are not familiar with this finish and presume it is analagous to the bronze finish put on china ware. This is simply copper powder burned on it and then glazed. It has a rich copper color and may be seen on cheap china. It is the only finish that we can suggest.

QUESTION No. 1321. Can yellow brass be successfully used for plumbers' brass goods and steam goods to stand considerable pressure? By this we mean from 75 to 100 lbs. per sq. inch. We know that it is being used for faucets, cocks, etc., which do not have to stand as much pressure, but we have tried it for higher pressure work and have so many leakages when the goods are tested, that it does not appear profitable.

*Answer.* Yellow brass can be used for goods of this character to stand considerable pressure, but, as you mention, the waste on account of leakages is quite large and far in excess of those made of red metal. Whether it is profitable will remain with the class of goods and your foundry practice. Yellow brass casts with more dross and oxide than red metal and these, becoming entangled in the metal, cause the leakage. Some concerns are using yellow brass for this class of work quite successfully.

QUESTION No. 1322. I have some chandeliers to give the oxidized copper finish and have copper plated them and then oxidized them in a liver of sulphur solution. The liver of sulphur seems to work badly as the copper is taken off in spots and the brass shows through. What there is left of the oxidized copper is all right and scratch brushes well. The copper seems to be good. Where is my difficulty?

*Answer.* Your trouble is that you did not put on a sufficiently heavy copper deposit. The liver of sulphur takes it off. If the liver of sulphur is too strong it will also take off the copper, but it will then be spotty.

QUESTION No. 1323. What is the effect of too much spelter in yellow brass for sand casting? Suppose, for example, there is added to yellow brass 5 per-cent more spelter than is in the brass. Will it injure it?

*Answer.* The more spelter is present in yellow brass, the dirtier the castings. In addition, the color begins to change when 40 per-cent and over is present. The best results are obtained in casting when the brass does not contain less than 66 per-cent of copper and if it contains more, the castings will come cleaner. It has been found preferable to use yellow brass of practically this copper percentage. A few per-cent less can be used, but it cannot be decreased very much, and still obtain a general run of good castings. This, of course, is on the assumption that no aluminum is used in it, as the general run of brass castings for plumbers' brass goods work is made without it.

QUESTION No. 1324. What will happen if a nickel solution is run hot?

*Answer.* Nickel solutions can be run hot and give good results and soft deposits. They should, however, be used much weaker than when employed cold. It is generally found unnecessary to use them hot as the trouble of heating and maintaining them is more than the gain in quality. Hot solutions deposit nickel very rapidly.

QUESTION No. 1325. Can as fine castings be made of yellow brass as of red metal? We have a lot of castings to make which must be practically perfect and free from imperfections, but the price is so low that we feel that we will have to make them of yellow brass. As the castings are to be nickel plated, it will not make any difference whether they are red or yellow. We have heard that it is impossible to make as good castings out of yellow brass as can be done with red metal. Will you advise us on this point.

*Answer.* It is difficult to make as good castings out of yellow brass as it is out of red metal. With a good composition, it will be found that a very large percentage of good castings can be obtained, while with yellow brass there will be found a considerable quantity of bad castings, both before machining and afterwards, on account of dross. If the castings are small, you can probably make them of yellow brass satisfactorily, but if of larger dimensions, we advocate the use of a good red metal, such as cheap composition, which will cast well and you will find a small percentage of bad castings. Even at the extra cost of red metal, you may find it cheaper to use it for large work. If you use yellow brass, and it is not for work to stand pressure, then use about 2 oz. of aluminum to each 100 lbs. of yellow brass, as it will promote soundness.

QUESTION No. 1326. I am troubled with my brass solution producing smoky deposits. The color of the brass is satisfactory if buffed, but for that which is not to be buffed it is not good. Have tried from 2 to 6 volts and additional cyanide. Also tried adding about 2 gallons of ammonia, but without result. What is the cause of the smoky brass deposit?

*Answer.* We think you will find sulphite of soda what you want as it serves to produce a clean deposit. Add about 2 oz. to each gallon of solution and if it does not aid you let us know. Sulphites in a brass solution prevent the formation of basic salts and thus give a clean metal.

QUESTION No. 1327. We have an inquiry for a bronze bearing in which a rolled or drawn bronze shaft is to run. What is the best kind of metal for this purpose? We would know what to use for this purpose if a steel shaft were to be used, but cannot find what the most suitable mixture is for a bronze shaft.

*Answer.* The use of a bronze shaft is not usual and while you do not say, we presume it is to be used for marine work. A wood bearing is often used for this purpose and a hard wood, such as lignum-vitae is the best. However, if you desire to use a metal bearing, then a soft mixture such as the following:

| | |
|---|---|
| Copper | 80 lbs |
| Tin | 10 lbs. |
| Lead | 10 lbs. |

would be satisfactory. A hard bearing is apt to cut the bronze shaft. Two similar metals do not form good wearing surfaces.

QUESTION No. 1328. We are bronze plating some brass hooks, and are having considerable trouble in spotting out. We have dried them out in an oven after plating but it does not seem to overcome the trouble. Can you inform us how the trouble can be prevented?

*Answer.* The trouble is caused by the plating solution entering the cavities in the casting and the best way to get it out is to soak it out in hot water. Have the water as hot as possible and allow the castings to soak in it for an hour or so. If changed several times it will produce better results. If actually boiling, it will work more rapidly and efficaciously.

QUESTION No. 1329. In making composition or bronze in which the mixture contains copper, tin, zinc and lead, does it make any difference in what order the metals are added?

*Answer.* As long as the copper is melted first it will really make no difference, although it is preferable to add the zinc first and then the tin and lead, as the melting points are lower than the zinc It is a rule to add the metals with the lowest melting point last, but there is no theoretical reason for it.

QUESTION No. 1335. How can the anodes be kept clean in an acid copper solution? They become black with smut which washes off easily but forms again in a little time.

*Answer.* The smut on the anodes is the impurities in the copper which do not dissolve in the acid copper solution. Arsenic, lead, antimony, Silver, gold (in very small amounts), bismuth, tellurium and selenium all remain in the slime on the anodes. There is no way of preventing it, but if you use the purest copper you will reduce it to a minimum. Using bags around the anodes might help some. This slime is objectionable in a solution for it settles on the work and causes roughness. Being metallic it is easily attracted by the work. You will have to filter your solution from time to time to free it from this fine slime from the anodes which floats in it.

QUESTION No. 1331. In what form does tungsten occur on the market.

*Answer.* Tungsten always occurs in the form of powder as it is reduced from the powdered oxide by means of hydrogen and the resulting metal is in the form of powder. As tungsten has the highest melting point of any metal, it has not yet been produced in the solid form.

QUESTION No. 1332. I have been experiencing considerable trouble in turning small aluminum castings on a lathe. The tool tears the metal and does not leave a clean cut. I have tried various kinds of tools and lubricants, but without satisfactory results. Can you advise me if it is in the metal? The brass founder who made the castings advises me that he used "the best mixture" and that it contained nothing but aluminum and copper.

*Answer.* Your trouble is with the mixture. While the aluminum and copper mixtures are the best casting mixtures, they do not turn as easily and as cleanly as others. A very satisfactory mixture for small castings of the kind you mention is as follows:

| | |
|---|---|
| Aluminum | 82 lbs. |
| Zinc | 15 lbs. |
| Copper | 3 lbs. |

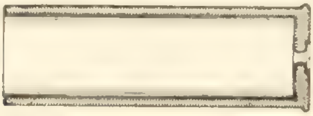
This mixture turns well and casts satisfactorily for small work. For large work the casting is apt to crack in the mold.

QUESTION No. 1333. What is the disadvantage of using a cold gold solution? We know it is customary to use it hot, but have never understood why.

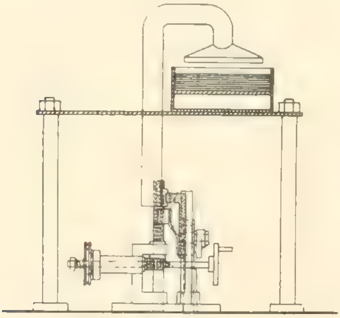
*Answer.* The reason for using a gold solution hot is that it deposits its metal more rapidly, covers better, gives a brighter deposit and a better color. You can use a gold solution cold, but it will have to contain more gold than a hot solution and more conducting salts. The color, too, is not particularly satisfactory and for this reason it is customary to use a gold solution hot

# Patent Abstracts.

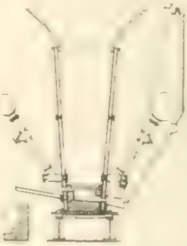
1,063,574, June 3, 1913. HOLLOW OR COMPOUND ARTICLE. John Ferreol Monnot of New York, N. Y. Assignor to the Duplex Metals Co. of the same place. A method of making cartridge shells. The base of the shells is of steel and they are coated, by means of a special process, with copper, nickel or other suitable non-ferrous metals. The steel is first coated with the non-ferrous metal by dipping while the metal is melted so that an adhesive coating is produced. The billet or plate so produced is then rolled into sheet, which becomes coated on both sides with the non-ferrous metal. By a special process, described in the specification, the cartridge shell is made. It is stated that the shells are particularly adapted for use with smokeless powder.



1,062,588, May 27, 1913. APPARATUS FOR COMPOSING AND DECOMPOSING METAL FOIL MOLDS OR FORMS. Jacob Heinrich of Furth, Bavaria, Germany. Assignor to the firm of Metallpapier-Bronzefarben-Blatt Metallwerke Aktiengesellschaft of Berlin, Germany. The apparatus is for composing or decomposing metal foil molds or forms of the kind in which the foils are taken off a pile by means of a suction nozzle. The object of the invention is to prevent the nozzle from taking off more than one foil at a time. This is accomplished by automatically regulating the distance between the bottom plate, carrying the pile of foils and the nozzle in such a way, that the distance is shortened by the thickness of one foil after the removal of such a one.



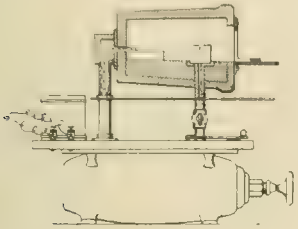
1,063,486, June 3, 1913. METHOD OF OBTAINING VALUES FROM COPPER BEARING MATERIAL. Howard F. Wierum of Upper Montclair, N. J. A process of smelting ore containing copper, or copper bearing material in such a manner that the heat is conserved, the sulphur in the ore may be obtained for the manufacture of sulphuric acid, and the oxidation of a larger portion of iron than has heretofore been done. This is accomplished by injecting silicious material with the blast. In smelting the ore, matte is first obtained and this is then smelted to metal in the same furnace.



1,055,538, Mar. 11, 1913. TUBE BENDING MACHINE. Johannes Ruckstinat of Toronto, Canada. The tube to be bent is forced around a forming block and the metal thus drawn to shape. The outer periphery of the bend is supported from the interior in the drawing operation. The object of the invention is to reduce the cost of manufacture of bend of thin tubing, used particularly in the manufacture of plumbers' traps. The tubes may vary in size and are bent in one operation.

1,063,570, June 3, 1913. PRECIPITANT FOR RECOVERING METALS FROM SOLUTIONS. Charles W. Merrill, of Berkeley, California. An alloy for precipitating gold and silver from a cyanide solution. This process is applied particularly to the obtaining of the gold and silver from the cyanide solution obtained in mining and which results from the leaching of ore with a solution of potassium cyanide. An alloy of zinc, lead, magnesium and aluminum is used and this is reduced to a powder and mixed with an abrasive in finely divided condition. The abrasive grinds off the surface of the alloy and exposes fresh metal for action. The alloy is used in place of zinc dust or shavings, ordinarily employed for the work.

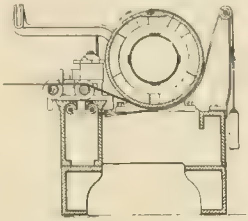
1,065,326, June 17, 1913. APPARATUS FOR MAKING CASTINGS. Harry P. Marshall of Glen Ridge, N. J. A process of casting metals under pressure. The method is adapted, more particularly, for making small castings such as those used for dental work. The metal is melted in a crucible on the top of the mold and by means of the electric current. When melted, a valve is opened and the metal is forced, by means of suction, into the mold itself. This is accomplished by a chamber underneath the furnace and from which the air has been exhausted. This connects with the mold, and at the right moment, when the metal is melted, the valve is opened and the metal is sucked into the mold.



1,064,995, June 17, 1913. SAND TEMPERING MACHINE. Charles F. Roush and Herbert Garnett of Toledo, Ohio. The invention relates to a device for tempering sand for use in foundries for the making of sand molds. The appliance takes the sand and automatically cuts it, mixes it with new sand, as may be desired, and then removes particles of metal which may be in the sand. Screening to the desired fineness is then carried out. The machine, in other words, treats the sand in the manner that would be done by a molder by means of a hand riddle and shovel.

1,064,713, June 17, 1913. COMPOSITION OF MATTER FOR THE TREATING OF MOLDING SAND. Thomas E. Coupe of Toronto, Canada. The objects of this invention are to effect a saving in the consumption of new sand in forming molds, to produce a cleaner and better surfaced casting thereby effecting a saving in the cost of finishing, and to provide a composition of matter which will produce a good binder so that a large percentage of floor sand may be used. The following ingredients are used: Linseed Cake Meal, 8%; Sea-Coal, ¾%; and Water, 91¼%. The ingredients are mixed and then applied to the sand in a liquid state. From 1600 to 1800 lbs. of sand to 200 or 400 lbs. of the mixture are used.

1,064,284, June 10, 1913. ZINC SHAVING MACHINE. Frederick W. Braun and Oscar C. Beach of Los Angeles, Cal. A machine for making zinc shavings or turnings from zinc plates. These shavings are used for precipitating gold from cyanide solutions. The object of the machine is to deliver clean shavings free from oxidation and this is accomplished by keeping the zinc cool and not allowing the shavings to reach a temperature which will heat them. This dissipation of heat is accomplished by having radiating surfaces adjacent to the zinc plate being cut, and employing a blast of air in conjunction with them.



1,063,629, June 3, 1913. RECOVERING COPPER FROM ITS ORES. Utley Wedge of Ardmore, Pa. Assignor to the Furnace Patent Company of Philadelphia, Pa. A method of recovering copper from its oxide or carbonate ores and which have heretofore resisted smelting in the ordinary way. The method employed is to mix the fine ore with iron pyrites and then oxidize in a furnace at a temperature at which the pyrites will be converted into sulphate of iron, which will, in turn, react with copper oxide and be converted into sulphate. The sulphate may then be leached out.

1,063,357, June 3, 1913. PROCESS OF ELECTRIC WELDING. Maurice Lachman of New York City. Assignor to the Standard Pulley Mfg. Co. of the same city. A method of electric welding which is applied more especially to tools. The method relates particularly to that class known as angle or T welding. The method avoids the production of a burr or fin at the weld, as has been the difficulty in angle welding heretofore.

1,056,456, Mar. 18, 1913. ELECTRIC FURNACE FOR MELTING AND LIQUEFYING FERRO-ALLOYS. Wilhelm Scehemmann and Jegor Bronn of Rombach, Germany. An electric furnace for melting metals. An alternating current is used in the furnace and the heating is accomplished by the use of two electrodes which give contact resistance instead of an arc.

# Trade Items.

The Cutting Motor Car Company of Jackson, Mich., manufacturers of the Cutting automobile, have gone into bankruptcy.

Additions to the plant of the Automatic Sewing Machine Company at Elgin, Ill., will be made at a cost of $10,000.

The Peerless Clothes Pin Company is to build a plant in Weatherford, Texas for the manufacture of wire clothes pins.

The Smith-Hudson Company has been incorporated in Charleston, W. Va., with a capital stock of $10,000 and will manufacture electrical devices.

The Galt Brass Mfg. Co. of Galt, Ont. Canada is to build an addition to their plant at a cost of $7,000. Plumbers' brass goods are manufactured.

The Federal Metal Company has been organized in Cleveland, Ohio, has acquired a site on Morgan Ave., and will shortly erect a plant for manufacturing. Brass goods are to be made.

The Lowell Insulated Wire Company of Lowell, Mass., manufacturers of insulated copper wire, are to erect an addition to their factory in that city. It will be 40 x 150 feet and located on Lincoln St

The Cooper Improved Roller Valve Company has been organized in Detroit, Mich., with a capital stock of $30,000, and will manufacture valves and steam traps. The incorporators are Lyman Cooper, C. S. Merritt, and M. B. Junkins.

The E. R. Caldwell & Son Brass Company Inc. has been organized in Syracuse, N. Y., and will operate a general brass foundry business. The company has been capitalized at $50,000 and the incorporators are E. R., R. L. and F. L. Caldwell.

The Emerson Laboratory of Springfield, Mass., analytical chemists, have outgrown their laboratory quarters at 177 State St. ,and which they have occupied for ten years. They have no secured the greater portion of the second floor of the Chapin Building at 145 Chestnut St., and have fitted up the new laboratory with the most modern and labor saving scientific apparatus.

The Bureau of Standards of Washington, D. C., are now prepared to carry out investigation in metallography in an extensive manner Microscopical and thermal analyses can both be done. The test which this bureau can carry out are as follows: Cooling and heating curves, melting points and the heat treatment of alloys. Preparation of specimens and photomicrographs of specified magnification up to 1000 diameters; and microscopical examination after special heat treatment. Examination of metals after failure for evidence of the cause of failure. Determination of various physical constants of metals and their temperature coefficients.

E. J. Brown has started to manufacture metal buckles, of various kinds of metals, with numerous finishes, at 46 Oliver St., Newark. N. J.

A new brass foundry is to be erected by the Rochester Bronze & Aluminum Company of Rochester, N. Y. This foundry will be 60 x 87 feet and it will be located on West Water St.

The Art Brass & Plating Works, 448 South Fifth St., Louisville, Ky., have started to manufacture a patent flat iron, which is operated by gasoline.

Fire destroyed the plant of the American Enamel Co. at Mashapaug Road, near Providence, R. I., on June 22nd, with a loss of about $100,000.

The addition to the iron and brass foundry of the Paxton-Mitchell Company of Omaha, Nebraska, is under consideration. It is to be 75 x 200 feet.

The Bureau of Mines, Washington, D. C., have issued a pamphlet entitled "The Flash Point of Oils: Method and Apparatus for its Determination". This pamphlet contains much valuable information on the testing of oils.

The Josiah Walsham Company has been incorporated in Providence, R. I., and has taken over the business conducted by the late Josiah Walsham for many years. The business is located at 48 Dudley St. and jewelry ornaments are manufactured.

The Parsian Novelty Company of Providence, R. I., manufacturers of jewelry novelties and located at 234 Chestnut St., was sold at auction recently to various buyers. The sale realized but about $300.00, and was not sufficient to meet the liabilities.

The Kendrick & Davis Co. of Lebanon, N. H., manufacturers of jewelers' tools, electric motors and fans, and sponge-plating devices, are to erect an addition to their works. It will be 48 x 56 feet and three stories high. Two water wheels will be added for the production of additional power.

A four story addition to the plant of the Cole Motor Co. of Indianapolis, Ind., is shortly to be made, and at a cost of $175,000. The building will be 100 x 500 feet. The capacity of the enlarged plant will be 6,000 automobiles per year. When the new addition is made, another of practically similar size will be erected on the present site of the one story plant.

The Harris Typewriter Mfg. Co., which succeeded the bankrupt Harris Typewriter Company of Fond du Lac, Wis., has perfected its reorganization and the plant is to be enlarged. It is stated that 15 typewriters are to be built daily. The entire output is to go to Sears, Roebuck & Company of Chicago, Ill., the large mail-order house. The officers of the new company are: President. F. J. Rueping; and secretary, T. L. Doyle.

The O. S. Backus Company of Brandon, Vt. has been reorganized and the manufacture of gas heaters has been started again. Electroplating is carried on.

The plant of the Champion Spark Plug Company of Toledo, Ohio is to be enlarged by the erection of a four story addition, 60 x 120 feet and four stories high.

The plant of the United States Gas Furnace Company of Providence, R. I., has been moved from 143 Eddy St. to 32 Garnet St. Gas furnaces for melting, heating, annealing and tempering are manufactured.

The Seth Thomas Clock Company of Thomaston, Conn. ,are making arrangements to install a wireless station at their works so that they may obtain time from Washington every day.

The Automatic Lamp Control & Accessory Company has been incorporated in Detroit, Mich., for the manufacture of automobile specialties. The principal stockholder is George W. Bowman of 123 Linden St., Deeroit.

The Western Electric Co. of New York City are to move their plant at 463 West St., New York City to Hawthorne, Ill., where their main plant is located. Manufacturing will be discontinued at the New York plant within a short time.

Forbes & Myers, Union St., Worcester, Mass., have started in the manufacture of electric motors, motor-driven grinding machines, and similar products. Induction motors without brushes are used. Buffing and polishing machines, motor-driven, are also manufactured.

The factory and office of the F. L. & J. C. Codman Co., 84-108 K. St., South Boston. Mass., buff wheel manufacturers, were completely destroyed by fire on June 12th. A new factory has been obtained at 15 Elkins St. and which has already been in operation for some time. The fire has not interfered with manufacturing or filling orders to any extent.

The American Iron & Brass Foundry Inc. has been incorporated in Los Angeles, California for the manufacture of fine castings in iron, brass, bronze and aluminum. A foundry has been leased at 688 Rio St. The capital stock of the company is $20,000 and the officers are: President, C. S. Smith; vice-president, William Francis; secretary, H. H. Jones; treasurer, A. H. Moore, and general manager, W. T. Rabun.

A 35 mile cable for telephonic communication between Vancouver and Vancouver Island, British Columbia has been manufactured in England and will be placed in commission. It weighs 560,000 lbs., and cost $100,000. The cost of laying is stated to be $20.000. This is stated to be the longest telephone cable in the world, and has been laid at a depth heretofore not attempted, much of it below 200 fathoms. The Canadian Government waived the duty on that part of the cable laid below the low water mark.

The Wright Wire Company of Worcester, Mass., manufacturers of wire and wire cloth, are to erect an addition to their main factory building and which will be 60 x 150 feet.

It is expected that the new plant of the Western Cartridge Company of East Alton, Ill., will be completed by the middle of the summer.

The Chase Rolling Mill of Waterbury, Conn., manufacturers of sheet brass, rods, wire and tubing, have issued a new price list of sheet brass taking effect July 1st.

R. H. Mayland & Son, of Brooklyn, N. Y., manufacturers of musical bells, have moved to their new factory buildings which they recently erected at 54 Willoughby St.

The East Braintree, Mass., plant of the Vanadium Metals Co. has been closed and the business transferred to Groton, Conn., where their other foundry is located. L. D. Beitzel, foreman of the plant, has moved to Groton.

The extensive oil production of the California oil fields may be appreciated when it is known that for the month of May, 7,639,144 barrels of crude oil were produced from the oil wells of this state. California is the largest oil producing state in the United States.

Work has been started on the addition to the plant of the American Wire Fabrics Company at Mt. Wolf, Pa. When completed the plant will have double of the present capacity. The extension is to be 80 x 200 feet. Wire cloth and screens are manufactured.

The United Novelty & Plating Company has moved from Newark, N. J., to West Medford, Mass. They are located at 9-11 Playstead Road and the manufacture of jewel boxes, metal novelties and jobbing electroplating will be carried on. A. E. Nelson and I. A. Harris comprise the company.

The line of automatic gas soldering-iron heaters, manufactured by the Oven Equipment & Mfg. Co. of New Haven, Conn., have been taken over by the Sentinel Automatic Gas Appliance Company of the same city. These heaters are of a novel type and have been developed by the Oven & Equipment Company after considerable experimenting.

The Eclipse Fuel Engineering Company of Rockford, Ill., have issued a catalogue of their products and which comprises a complete list of the goods made by them. It comprises furnaces for melting all kinds of metals, hardening furnaces, tank heaters, brazing furnaces and many other kinds of fuel appliances. This catalogue contains 168 pages profusely illustrated with reproductions from photographs.

The Hill Laboratory of Buffalo, N. Y., make a specialty of the analyses of the non-ferrous metals, alloys and other products used in the brass and plating trades. Rapid and accurate work are turned out and electroanalyses are made wherever possible, thus insuring accuracy and rapidity. Herbert M. Hill, Ph. D., is the proprietor and the laboratory is at 20 West Eagle St.

Operations have been started on the new [illegible] & [illegible] of Marietta, Pa.

The plant of the [illegible] Stove & Range Company has been taken over by the Lewisburg Foundry Company of Lewisburg, Tenn.

The Knott Mfg. Co. of Fort Wayne, Ind., manufacturers of plumbers' brass goods and supplies, is contemplating moving its plant to Tell City, Ind.

The [illegible] Company of 180 North Dearborn St., Chicago, Ill., manufacturer of hardware specialties, are to move their plant to Streator, Ill.

The plant of the Modern Specialties Company of Goshen, Ind., has been moved to South Bend, Ind. Sad-irons with a self-heating appliance are manufactured.

The Vixen Tool Company, 5013 Lancaster Ave., Philadelphia, Pa. is now manufacturing a special machine for the automatic sharpening of files.

The Dobel Manufacturing & Plating Co. has been organized in Buffalo, N. Y. and will equip a plant for electroplating. The organizers are N. J. and M. J. Dobel and J. W. Kirkpatrick.

A new site has been purchased by the Unique Brass Foundry Company, 25 Illinois St., Buffalo, N. Y., and a new plant will be erected this summer. The location is at Grant St. and N. Y. C. R. R.

The plant of the Medicine Hat Pump & Brass Mfg. Co., of Medicine Hat, Alberta, Canada, is shortly to be erected. This company was recently organized with a capital stock of $50,000. Considerable equipment will be needed.

The Plainville Stock Company of Plainville, Mass., manufacturers of jewelry, has dissolved and the business will be continued by William S. Metcalf and the name will not be changed. The company has, heretofore, been conducted as a partnership.

Eimer & Amend, 205 Third Ave., New York City, dealers in chemical apparatus and chemicals, have recently issued a new and extensive catalogue of chemical and assay laboratory supplies. This is called "Catalogue C" and contains 480 pages. It is cloth bound.

The Société des Trefileries et Laminoirs du Havre of Harve, Frange, operate brass and copper rolling mills. The manufacture of copper, brass, bronze steel and aluminum sheet and wire is carried on. The Société d'Electro-Metallurgie of Dives, near Havre also operates a similar mill and recently commenced the manufacture of tin-foil.

A new, high temperature muffle furnace has recently been placed on the market by the Improved Appliance Company of Brooklyn, N. Y. A more intense heat than that obtained by the ordinary muffle furnace is obtained and it is claimed that 2500° F. can be obtained. The furnace can be operated with or without the blast, but a lower temperature only can be obtained without the blast. Gas is used for the fuel.

[illegible] $100,000 [illegible]

New property has been acquired in Elizabeth, N. J., by the Diehl Mfg. Co., manufacturers of electric fans and motors, and a new plant is to be erected upon it.

The Bagley Manufacturing Company has started in the manufacture of jewelry at 26 Harrison St., Providence, R. I. Bracelets, buttons, clasps, etc., will be manufactured.

The Consolidated Car Heating Company of Albany, N. Y., manufacturers of car heating appliances, are to build a new brass foundry at their plant in that city.

The name of the Chase Corporation of Waterbury, Conn., which controls the Chase interests of that city, has been changed to the Chase Metal Works, Inc.

The Michigan Smelting & Refining Company of Detroit, Mich., has let the contract for an addition to their already extensive plant in that city.

The Silver Alloys Corporation has been incorporated in Lynbrook, N. Y., for the manufacture of metals and alloys. The incorporators are C. Wharton, J. F. Wiggin and S. H. Mills.

A factory is to be built by the Wahl Adding Machine Company of Chicago, Ill., manufacturers of computing machines. The factory will be 125 x 175 feet and will be located at Roscoe Boulevard and West Ravenswood Park.

The American Shear & Knife Company of Hotchkissville, Conn., manufacturers of cutlery and which recently went into the hands of a receiver, has been purchased by R. A. Clark of Kansas City, Mo. It is reported that the plant will be enlarged and the business continued.

The Standard Underground Cable Company of Pittsburgh, Pa. and Perth Amboy, N. J., manufacturers of insulated copper wire, bare copper wire and brass and bronze wire, are to erect a new office building in Pittsburgh at 116th. and Pike Sts., and to which the offices in Perth Amboy and Canada will be moved.

The plant and equipment of the Warren Motor Car Company of Detroit, Mich., manufacturers of the "Warren-Detroit" automobile, was sold at auction on June 26th, to Charles F. Rands of the Rands Mfg. Co., and it will be utilized for the manufacture of automobile accessories. The company was sold at receiver's sale.

The American Trolley Wheel Co. has been incorporated in Buffalo, N. Y., for the manufacture of a new patented trolley wheel. The company has been capitalized at$1,000,000. The wheel will be manufactured by outside parties for the present, but later a plant will be built and equipped. The directors of the company are L. Bradley Dorr, 300 Jefferson St., Buffalo, N. Y., Joseph Culp of Hamilton, Ont., and W. S. Jackson of Indianapolis, Ind.

The A. & J. Manufacturing Company of Gadsden, Ga., manufacturers of stoves, are building an addition to their plant.

An addition to the plant of the Union Pin Company of Winsted, Conn., is to be made. It will be one story high and is to be located at 170 Lake St., the site of the present plant.

The Binghampton Iron & Metal Company has been organized in Binghampton, N. Y., and has taken over the business of the Binghampton Metal & Paper Company.

Arrangements are being made for the erection of a new casting shop at the plant of the Scovill Mfg. Co. of Waterbury, Conn. It will be 50 x 80 feet and one story high.

The Buckwalter Stove Company of Royersford, Pa., stove manufacturers, are to install a sand blast cleaning system in their works. They are also to increase their polishing equipment.

The brass foundry of the Wiener-Barnet Co. at 328 Adams St., Newark, N. J., was recently destroyed by fire with a loss of $10,000. Saddlery hardware and automobile goods are manufactured by this company.

The National Quality Lamp Company of Cleveland, Ohio, manufacturers of automobile lamps, are to spend $17,000 in improvements to their plant. This company is owned by the General Electric Company of Schenectady, N. Y.

The Parker White Metal & Mch. Co. of Erie, Pa., have moved to their new plant at 23rd. St. and Railroad Ave. The new facilities now had for manufacturing will give them three times their former capacity. Die castings are manufactured.

The Mark Mfg. Co., of Evanston, Ill., are manufacturing a pipe union of cold-drawn steel and which, it is claimed will replace, to a large extent, bronze and malleable iron unions. In order to protect from rust, the unions are coated with zinc by sherardizing.

The Quigley Furnace & Foundry Company of Springfield, Mass., have obtained the contract for the furnace equipment of the new building of the Edison Storage Battery Company of Orange, N. J. The contract calls for 59 over-fired furnaces using oil fuel.

The Superior Plating Works has been incorporated at 619 La Salle Ave., Chicago, Ill. with a capital stock of $40,000. The company has been conducting a plating business for some time at the same location but have now incorporated. The incorporators are F. J. Setchett, W. K. Greene and E. L. Kreamer.

The plant of the Fred M. Presscott Steam Pump Company at West Allis, Wis., manufacturers of steam pumps, is to be closed and the machinery is to be shipped to plant of the Power & Mining Company at Cudahy, Wis., and the two plants consolidated. The Prescott plant is owned by the International Steam Pump Company and was purchased by them about a year ago. Some 750 men will be thrown out of employment.

Improvements are to be made to the plant of Richmond Bros. of Newark, N. J., manufacturers of metal buttons and metal specialties The plant is located on Chestnut St

A nwe plating department is to be built at the works of the General Electric Company at Lynn, Mass This will comprise a building 60 x 180 feet.

A new plant is to be built by the International Nickel Co. of Bayonne, N. J., at a cost of $15,000. It will be built in the Constable Hook District.

The Wayne Brass Foundry Company of Pittsburgh, Pa., have moved to their new foundry on Butler St. Brass and aluminum castings are manufactured.

A new machine ship is to be erected by the Hanson & Van Winkle Company of Newark, N. J., at a cost of $4,200. It will be 40 x 49 feet.

The Western Ontario Electric Company, Ltd., St. Thomas, Ont., Canada, has been incorporated for the manufacture of electric appliances and specialties. The capital stock is $25,000.

A site for a new brass foundry has been purchased by the American Bronze Company of 1415 Niagara St., Buffalo, N. Y. The site is at Arthur St. and Erie R. R., North Buffalo, and the new foundry will be built this summer.

The Massachusetts Saw Works of Springfiled, Mass., manufacturers of hack saws, will locate a branch factory in Hamilton, Canada. A two story building has been leased and about 75 hands will be employed. It will be conducted as an entirely separate plant.

A new plant is being built for the manufacture of stoves by the Barker Foundry Company Ltd. of Brighton, Ont. Canada, recently incorporated with a capital stock of $100,000. The new company has taken over D. J. Barker & Co. of Pictou, Ont. A general foundry business will also be carried on.

The Titan Copper Products Company has been incorporated in Buffalo, N. Y., with a capital stock of $25,000 and will erect a plant. Titanium alloys will be manufactured. The directors of the company are Charles V. Slocum of Buffalo, N. Y., and W. W. Slocum and Alexander N. Slocum of Pitsburgh, Pa.

A plot of land, 25 acres in extent, has been purchased by the Canadian Kodak Company of Toronto, Canada and an extensive plant will be built upon it. The site is located on Eglington Ave., near the Weston road. It is reported that $1,250,000 will be spent upon the buildings and that over a thousand hands will be employed within a few years.

Edward R. Caldwell of the Caldwell & Ward Brass Company of Syracuse, N. Y., as stated elsewhere, has started the E. R. Caldwell Brass Co. He has disposed of his interest in the Caldwell & Ward Brass Company to Porter B. Ward. The Caldwell & Ward Brass Co. will continue in business as heretofore.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98-99% | lb. | .22 |
| Acid, Acetic, pure, 30% | lb. | .07 |
| [illegible] | [illegible] | [illegible] |
| Acid, Benzoic | lb. | .55 |
| Acid, Boracic (Boric), pure | lb. | .12 |
| Acid, Hydrochloric, see Acid, Muriatic | | |
| Acid, Hydrofluoric, 30% | lb. | .04 |
| Acid, Hydrofluoric, 50% | lb. | .10 |
| Acid, Muriatic, 20° | lb. | .02 |
| Acid, Muriatic, c. p., 20° | lb. | .07 |
| Acid, Nitric, 38° | lb. | .05⅝ |
| Acid, Nitric, 40° | lb. | .05⅞ |
| Acid, Nitric, 42° | lb. | .06¼ |
| Acid, Nitric, c. p., | lb. | .08 |
| Acid, Sulphuric, 66° | lb. | .01¾ |
| Acid, Sulphuric, c. p. | lb. | .06 |
| [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] |
| Alum | lb. | .04 |
| [illegible] | [illegible] | [illegible] |
| Ammonium Sulphate | lb. | .07 |
| Aqua-Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | lb. | .04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | lb. | .06¼ |
| Ammonia Water, c. p. | lb. | .08 |
| Ammonium Carbonate, lump | lb. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | lb. | .12 |
| Ammonium Hydrosulphuret | lb. | .30 |
| [illegible] | [illegible] | [illegible] |
| Ammonium Suphocyanate | lb. | .50 |
| [illegible] | [illegible] | [illegible] |
| [illegible] | lb. | [illegible] |
| Arsenic, Metallic | lb. | .10 |
| [illegible] | [illegible] | [illegible] |
| Argols, White (Cream of Tartar) | lb. | .31 |
| Asphaltum, Commercial | lb. | .05 |
| Asphaltum, Egyptian (Bitumen) | lb. | .30 |
| Benzine | gal. | .15 |
| Benzol, Pure | gal. | .60 |
| [illegible] | [illegible] | [illegible] |
| Bitumen, see Asphaltum. | | |
| Blue-Vitrol, see Copper Sulphate. | | |
| Borax, Crystals or Powdered | lb. | .10 |
| [illegible] | lb. | [illegible] |
| Cadmium, Metallic | lb. | .85 |
| Carbon Bisulphide | lb. | .10 |
| Calcium Carbonate (Precipitated Chalk) | lb. | .10 |
| Chrome-Green | lb. | .50 |
| Copper, [illegible] | lb. | [illegible] |
| Copper, [illegible] | lb. | [illegible] |
| Copper, [illegible] | lb. | [illegible] |
| Copper, [illegible] | lb. | [illegible] |
| Copper, [illegible] | lb. | [illegible] |
| Copper, [illegible] | lb. | [illegible] |
| Copper Acetate (Verdigris) | lb. | .35 |
| Copper Carbonate | lb. | .16 |
| Copper Sulphate (Blue-Stone) | lb. | .06 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | lb. | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | lb. | .10 |
| Emery Flour | lb. | .04 |
| Emery, F F & F F F | lb. | .03 |
| Flint, powdered | lb. | .01 |
| Flour-Spar | lb. | .01¼ |
| [illegible] | [illegible] | [illegible] |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | lb. | .30 |
| Gum Guiacum | lb. | .26 |
| [illegible] | lb. | [illegible] |
| Gum Sandarac | lb. | .35 |
| Gum Shellac, brown | lb. | .50 |
| Gum Shellac, white | lb. | .60 |
| [illegible] | oz. | [illegible] |
| Iron Perchloride | lb. | .25 |
| Iron Sulphate (Copperas) | lb. | .05 |
| Lead Acetate (Sugar of Lead) | lb. | .15 |
| [illegible] | lb. | [illegible] |
| Lead, Red | lb. | .12 |
| Lead, Yellow Oxide (Litharge) | lb | 12 |
| Liver of Sulphur, see Potassium Sulphide. | | |
| Manganese, Ferro, 80% | lb | .10 |
| Manganese, Metallic, pure | lb. | .75 |
| Magnesium, Metallic | lb. | 1.50 |
| [illegible] | [illegible] | 1.12 |
| [illegible] | lb. | .39 |
| Mercury Nitrate | lb. | 1.50 |
| Mercury Oxide, yellow | lb. | 1.80 |
| Nickel and Ammonium Sulphate (Double [illegible] | lb. | [illegible] |
| Nickel Carbonate, dry | lb. | .60 |
| [illegible] | lb. | [illegible] |
| Nickel Metallic | lb. | .45 |
| [illegible] Sulphate (Single Salts) | lb. | [illegible] |
| Nitre [illegible], see [illegible] Nitrate. | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Parafine | lb. | .15 |
| Phosphorus, yellow | lb. | .40 |
| Phosphorus, red | lb. | 1.10 |
| Pitch | lb. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Cloride | oz. | 46.00 |
| Platinum Metallic | oz. | 48.00 |
| [illegible] | lb. | [illegible] |
| [illegible] | lb. | .06 |
| Potassium Bichromate | lb. | .14 |
| Potassium Bitartarate (Cream of Tartar) | lb. | .31 |
| Potassium Carbonate (Pearlash) | lb. | .10 |
| Potassium Chlorate | lb. | .15 |
| Potassium Cyanide | lb. | .25 |
| [illegible] | lb. | [illegible] |
| Potassium Nitrate (Nitre or Saltpetre) | lb. | .10 |
| Potassium Permanganate | lb. | .17 |
| [illegible] | lb. | [illegible] |
| [illegible] | lb. | [illegible] |
| Potassium Sulphide (Liver of Sulphur) | lb. | .15 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | lb. | .70 |
| Pumice, Ground | lb. | .05 |
| Quartz, Powdered | lb. | .01 |
| Rosin, Yellow | lb. | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .58½ |
| Silver Nitrate, crystals | oz. | .50 |
| Soda-Ash | lb. | .05 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | lb. | .15 |
| Sodium Carbonate (Sal-Soda), crystals | lb. | .02 |
| Sodium Hydrate (Caustic Soda) | lb. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | lb. | .45 |
| Sodium Hyposulphite ("Hypo") | lb. | .04 |
| Sodium Metallic | lb. | .90 |
| Sodium Nitrate | lb. | .05 |
| Sodium Phosphate | lb. | .09 |
| Sodium Silicate (Water-Glass) | lb. | .04 |
| Soot, Calcined | lb. | .15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | lb. | .05 |
| Tin Chloride | lb. | .43 |
| Tin, Metallic | lb. | .41¼ |
| Turpentine, Venice | lb. | .35 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal. | .15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | lb. | .45 |
| Wax, Carnauba | lb. | .70 |
| Whiting (Ground Chalk) | lb. | .02 |
| Zinc [illegible] | lb. | .12 |
| Zinc, Chloride | lb. | .12 |
| Zinc, Sulphate | lb. | .06 |
| Zinc, Spelter | lb. | .05⅜ |

# THE
# BRASS WORLD
# AND
# PLATERS' GUIDE

**VOL. IX. BRIDGEPORT, CONN., AUGUST, 1913. No. 8.**

**A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.**

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## The Possibility of a Future Tin Famine.

The tin supply of the world is a matter that is already giving the consumer much anxiety. There does not seem to be any substitute for it and notwithstanding its enormous rise in price within the past few years, the supply has not increased; in fact, there has been a decrease within the past two years.

Tin is found very sparingly upon the surface of the earth and in 1910, which is as far back as statistics can be obtained, the total production of the world amounted to 105,704 tons. The greater part of this quantity was produced in the Straits Settlements, while the remainder was obtained in Australia, China and England. It is stated that the tin deposits of Malacca, which in 1910 produced 54,000 tons or the greater part of the tin supply of the world, will become exhausted before many years. The other deposits do not hold out much promise of being able to make up for this falling off in the tin supply of the world. It will readily be appreciated, therefore, that unless some other deposits of tin are found the supply will not be increased.

As previously mentioned, there appears to be no substitute for tin, although in some lines of trade, it has been replaced by aluminum. The largest use for tin is in the maufacture of tin plate and the largest consumption of tin plate is in manufacture of tin cans for food containers. For this purpose, nothing has been found, even at a greater expense, that will take its place. Not only is the tin coating necessary for preventing the rusting of the iron upon which it exists, but the tin itself is required for its non-corrosive qualities. In addition, it can be readily soldered. Taking these three properties into consideration, it does not appear probable that any substitute for tin plate will be found which can be used for food. Large quantities of tin plate are used for making other kinds of containers, such as paint, varnish, oil and similar cans. It is possible that some other metal such as zinc might be used as a coating for this purpose although as yet it has not been done. Some of the enamels used answer very well and perhaps when combined with a zinc coating might be employed for some purposes.

In the bronzes and solders, tin must be used and there has never been any substitute for it. While the consumption of tin in these materials is not as large as it is in the case of tin-plate, it is, nevertheless, a very important one. Without bronzes and without solder, the whole manufacturing industry would undergo a vast change.

The future tin supply, therefore, is far more important than the majority of persons imagine, and while the present generation may not see a radical change, the future would appear to have something in store for it in the way of a possible tin famine. The price of tin is already a serious matter in the metal trades, and there is a probability that it will become worse rather than better.

## What Increasing the Conductivity of Plating Solutions Means.

The use of the so-called "conducting salts" in plating solutions is now quite common and their use is theoretically correct. In nickel plating solutions, sal-ammoniac is employed, in brass and copper baths carbonate of soda is used, while in gold plating solutions it is customary to introduce sodium phosphate for this purpose.

A conducting salt is supposed to increase the conductivity of the plating solution for electricity and to have no other action. While the use of conducting salts in plating solutions is not new, they have not been as extensively employed in the past as they now are as there was, in reality, less need for them. When the plating barrel came into existence and higher voltages had to be employed in running them, the need for conducting salts began to be appreciated.

By the use of conducting salts in plating solutions, two things are gained:

1. Less voltage is required.
2. The solution will not heat as rapidly.

Taking into consideration the fact that less voltage is required, it may be said that this feature represents a reduction in power costs. If, for example, it takes 5 volts to force 200 amperes through a plating solution, and by the use of a conducting salt, the same number of amperes are forced through with 2½ volts, then the cost of power is reduced one half. The volts multiplied by the amperes give the watts used and it will be readily seen that with 2½ volts there are only one half the number of watts consumed as in the instance of the 5 volts. As current consumption is measured in watts, the cost, therefore, is reduced 50 per-cent. This reduction in current, although of small importance in the case of a shop where the amount of plating done is small, will become of large importance in instances where considerable plating is carried on.

As regards the heating of the solution, this feature is of much importance, too, as there are many instances in which a hot solution is neither desired nor advisable. In case no conducting salt is used, the resistance of the plating solution is greater than when it is employed. When resistance must be overcome by the current, heat is always generated, no matter whether it is a solution or a metal. Were it not for this fact there would be no advantage of employing copper wire for conducting an electric current and iron could be used as well.

Lowering the resistance of a plating solution by the use of a conducting salt, therefore, means that less heat is generated by the passage of the current.

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A history of the brass and copper trades is being compiled by a number of leading metallurgists in England who are identified with the brass and copper industry in that country. A few Birmingham brass manufacturers have provided the funds necessary for the carrying on of the work. The editorial committee consists of Geo. W. Mullins of the Kings Norton Metal Co., and who is also chairman, Philip M. Ellis of Charles Ellis & Sons, J. S. Harrison, late of the Birmingham Metal & Munitions Co., and Robert K. Dent, who is also editor.

# The New Brass Foundry of The English & Mersick Company of New Haven, Conn.

The English & Mersick Company of New Haven, Conn., manufacture automobile and carriage hardware, and lamps. They are among the oldest in the business and have always produced the highest grade goods possible to manufacture. Their original business was the manufacture of carriage hardware and lamps, but at the beginning of the automobile era they realized that it was only a matter of time when the coach and carriage would be crowded out by the motor car and that to commence the manufacture of hardware for it would be a case of necessity. They began the manufacture of the automobile goods in a small way and have kept pace with the rapid and remarkable growth of the business until at the present time this class of work comprises nearly all of their product. Fine coaches, which, in the past, took the fine grades of hardware and lamps are almost a thing of the past and the quantity consumed is small compared with the output for automobile work.

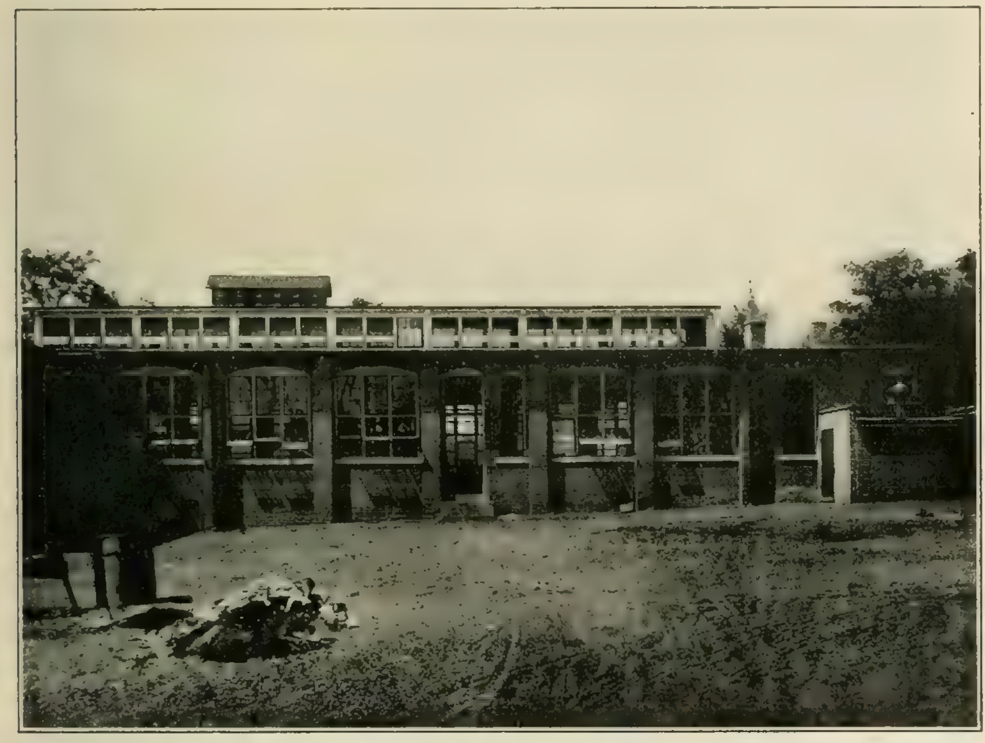


Fig. 1. Exterior View of Brass Foundry of The English & Mersick Company of New Haven, Conn.

The English & Mersick Company have always made a specialty of high grade work and have never attempted to cheapen it in any way; in fact, they have always endeavored to improve it even though the cost might have been increased thereby. An inspection of their factory will demonstrate this fact and particularly in the case of their brass foundry. All work is done by hand and no machine molding is attempted, as it has been found that if the highest quality of work is demanded, hand molding must be used. The best class of brass molders consider it beneath them to work on a machine and, for this reason comparatively unskilled labor must be employed on it. The result is then not as good.

The growth of the automobile hardware trade has been so rapid that the English & Mersick Company found it necessary to build a new brass foundry to take care of their trade. This foundry is situated on Winchester Ave., and represents the result of consid-

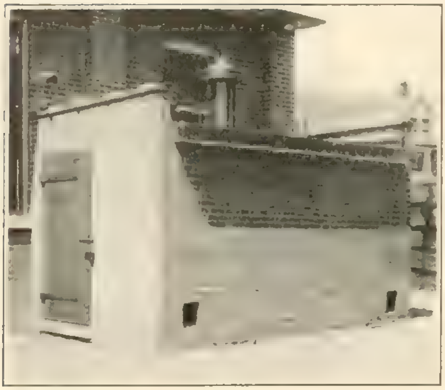


Fig. 2. Transformer House.

erable thought and study so that one adapted to the special needs of the company could be constructed. A foundry that is admirable and particularly suited for one class of work would not be adapted at all for another, and bearing this feature in mind, the new foundry of the English & Mersick Co., has been built.

The foundry is of brick, one story high and 41 x 105 feet with an L 25 x 35 feet. The outside of the foundry is shown in Fig. 1. Ample ventilation is given the building by ventilators in the roof and this has been found so adequate that very little smoke is ever found in the foundry. Particular care was taken in the design of the building to supply plenty of light for molding, and it has not been wasted as the molders, under such conditions, are always able to turn out the best class of work. Where hand molding is done and the finest class of work made, molders cannot have too much light. The old foundries, of which many are still in operation, were deficient in light and it was not an uncommon occurrence to find a molder working in broad daylight with a lamp. This, of course, has been found more particularly in floor molding, but bench work was not sufficiently lighted so that the best work could be done. As the majority of automobile hardware used in the trade is small, the work in

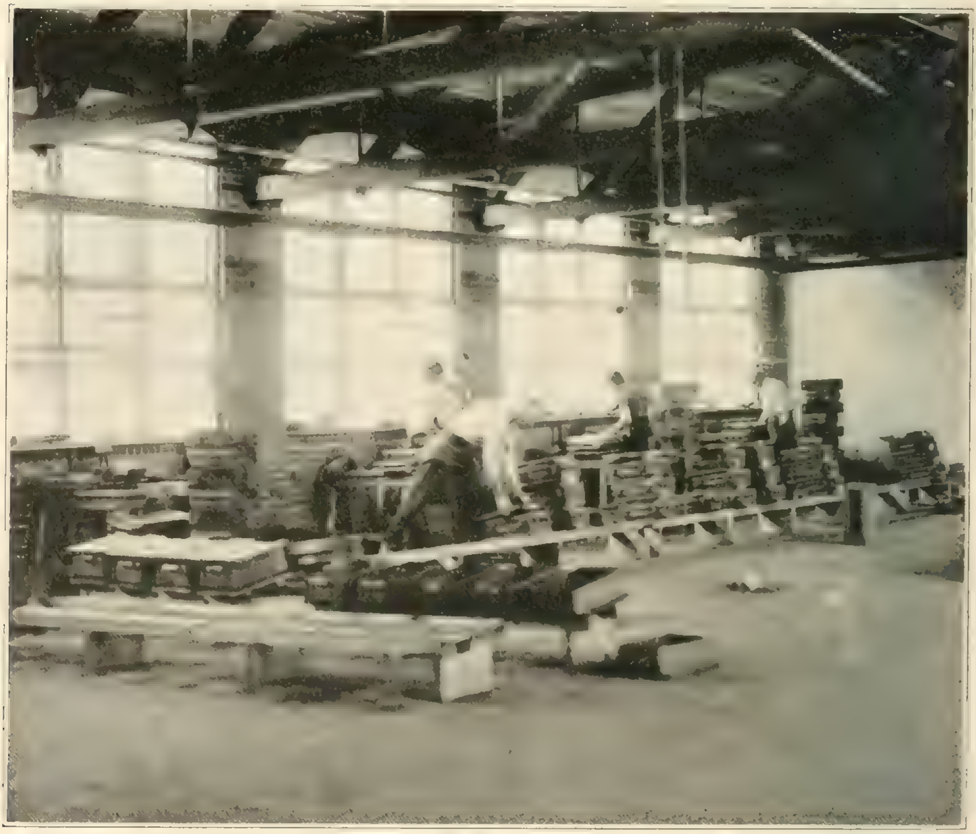


Fig. 3. Interior of the Brass Foundry Showing Bench Molding.

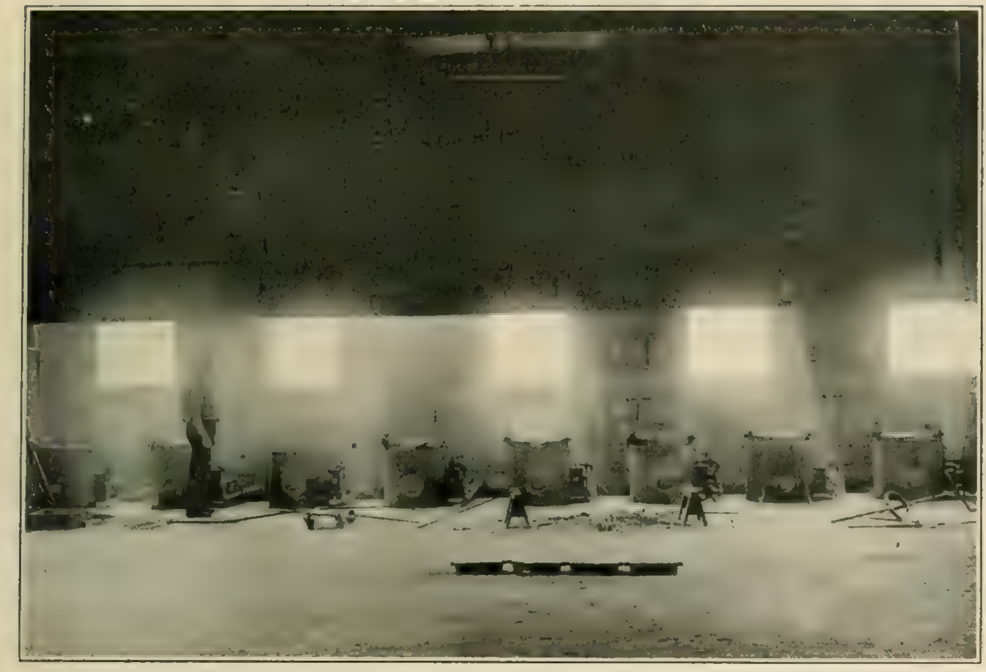


Fig. 4. The Eight "Steele-Harvey" Melting Furnaces of Stationary Type and Using Oil for Fuel.

the foundry is confined to bench molding, but should occasion demand, ample room is had for any floor work which might come up.

The power used in the factory for operating the blower, sprue cutter and other machinery is supplied by motors. The current is obtained from the city and, owing to the high voltage used in transmission, is "stepped down" by means of transformers to the necessary low voltage used for running the motors and at the same time eliminating any danger in the foundry from the use of high

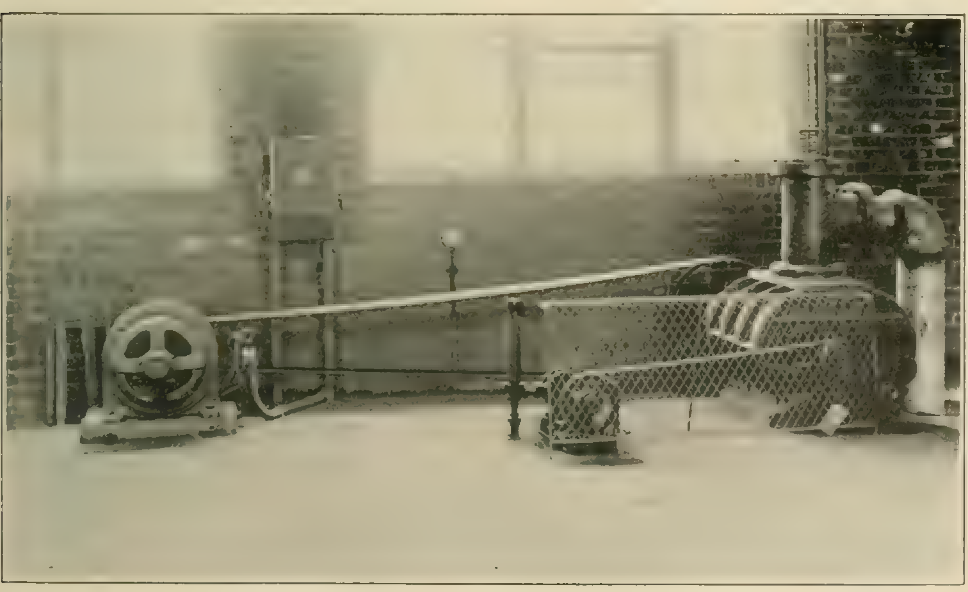


Fig. 5. The Blower and Electrical Equipment for Driving It.

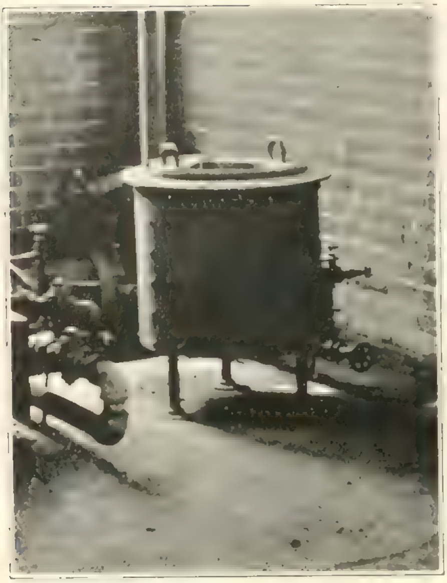


Fig. 6. Solder Melting Furnace Using Oil for Fuel.

voltage current. The transformer house is shown in Fig. 2. This is of brick and is kept under lock and key.

The interior of the foundry is shown in Fig. 3. It will be noticed that the ordinary tub is used for holding the molding sand as this has been found quite satisfactory. For the fine class of molding turned out, No. 0 Albany molding sand is used. The molding is ordinarily done in iron flasks, but for some classes of work snap-flasks are used. Green sand is used for all the work. From 48 to 60 molds per day are put up by one man. The molder does not do his own melting but a special melter is employed for the work. He pours his own castings, however. The manner of piling the molds for pouring is rather unique and rarely seen in a brass foundry. Three molds are made into a pile, the middle and top ones acting as weights. In this manner it is unnecessary to use weights for any of the molds except that on the top. The molders claim that it makes less work for them in handling the molds, both before and after the pouring of the metal.

For melting, oil is exclusively used, and 8 "Steel-Harvey" furnaces are installed in one end of the building. These furnaces are shown in Fig. 4 and are of the stationary type. Owing to the small size of the pots used (from 25's to 40's) it was found far more expedient to use a stationary furnace. Hot metal can then be produced and needs no transferring as it does in the case of a tilting furnace when the metal must be poured into a comparatively cold ladle or crucible. This transferring, with its accompanying cold metal, was one of the early obstacles in the use of oil furnaces for small work. The metal was cooled down too much in transferring it from the furnace to the molds. By the use of the stationary furnace this feature is avoided and any desired heat may be obtained, and the employment of this manner of melting has allowed the use of the oil furnace in foundries making small work, where previously it was not used with success on account of the difficulty of obtaining the necessary pouring temperature for small castings.

The furnaces shown are situated in one end of the building and a large sheet iron hood, running the full width of the building has been installed so that the heat and smoke are carried out without contaminating the foundry. The pots are lifted out of the furnaces by hand by means of basket tongs.

The oil used for the fuel is stored outside of the foundry building in an underground steel storage tank, 38 feet long and 7 feet in

Fig. 7. The "Monarch" Core Oven.

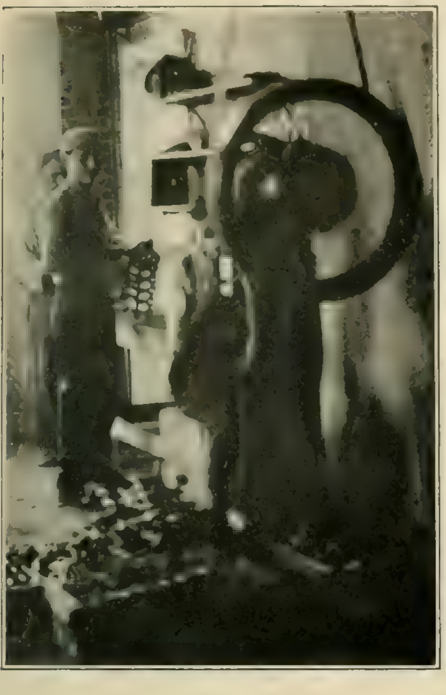


Fig. 8. Cutting Off Gates.

diameter. This tank holds approximately 10,500 gallons of oil which supplies ample storage for the needs of the foundry. It has been found expedient to have a large storage capacity to take care of any emergency which may occur.

The blower and oil pump for serving the furnaces are shown in Fig. 5 and are operated by means of a motor. The blower is of the forced blast type and is of sufficient size to supply what air is required for the operation of the full number of furnaces.

In the making of the lamps and automobile hardware, considerable solder is required and to take care of this end of the business, a solder furnace has been installed. This furnace was made by the Monarch Engineering and Mfg. Co., of Baltimore and is shown in Fig. 6. It is operated by oil and the solder is melted in an iron kettle. The rapid melting of the tin and lead, required for the manufacture of the solder, takes place readily and it has been found quite satisfactory as the best grade of solder may be rapidly made in it and at a cost as low as anyone can manufacture it from new metals.

Cores are dried in a "Monarch" core-oven shown in Fig. 7. This oven is intended for small cores and is operated by coal as it has been found quite satisfactory for the comparatively small amount of work made. Not all the work made by the English & Mersick Co. is cored and the number of cores used is not large.

The gates are cut from the castings by means of a sprue-cutter operated by power. This cutter is shown in Fig. 8 and one man is constantly employed on the work. The use of the sprue cutter has been found satisfac-

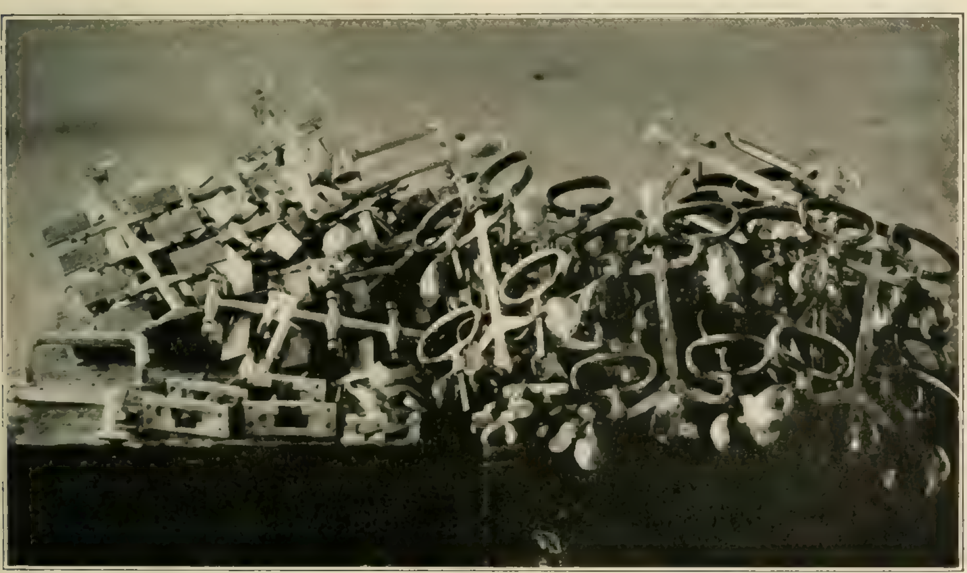


Fig. 9. Assortment of Castings Before Removal from the Gates.

tory and as the castings are small and well gated, there is little waste in sprue ends. For large castings and risers, a saw is preferable, but for small work, the labor required for cutting the gates on a sprue cutter is so small that it more than offsets the waste in metal caused by grinding.

After the gates have been cut from the castings they are subjected to pickling in sulphuric acid. This procedure has been found advantageous for the reason that nearly all of the work and in fact, practically all, is afterwards machined. Sand and other foreign matter is thus removed so that the castings may be inspected to a better advantage and there is nothing to affect the tools when the machine work is done upon them. All of the castings produced in the foundry are treated in this manner.

In Fig. 9 is shown some of the castings turned out before they have been cut from the gates. The method of gating and the kind of castings turned out may be understood from this assortment. A special white metal is now made by the company for ornamental work which has met with excellent success. It is a solid white nickel alloy and is used for all classes of ornamental work where the best possible metal is desired. This metal can be used without plating or it can be nickel or silver plated when desired. It is stronger than brass or composition and takes a high polish and has a silver white color. At the present time it is being supplied to the leading car manufacturers for handles, hinges, locks and all other parts of the car that have been made of brass and are exposed.

## A German Brass Manufacturers' Syndicate.

After nearly four years of free competition, a majority of the German brass manufacturers have just formed a new combination for the protection of what are described as the "economic, politico-social, and technical interests" of their industry. Taught by the failure of a previous and more ambitious attempt to run the German brass industry on the familiar trust lines, the present combination is of a less rigid character, although it may in time, given favourable market conditions and the goodwill of a number of manufacturers who are at present keeping aloof, develop into an organisation regulating prices and sales. As the centre of the German brass industry lies in the Western industrial districts of the Empire, the new association, of which the chairman is Herr Aschoff, managing director of the well-known firm of Basse & Selve, of Altena, will have its headquarters at Cologne.

A brass syndicate, or rather a brass trust, existed in Germany from April 1907 to October 1909, when it came to grief. The old syndicate, although it grew more autocratic as time went on, as is the way of syndicates, and thereby forfeited whatever good will it may at first have enjoyed, was founded mainly as a justifiable act of self defence. In the spring of 1907 copper and spelter, the principal raw materials of the industry, although already tending downwards, were still extremely high in price, standard copper being quoted at about 96*l*., and spelter at about 25*l*. 15*s*.; whereas to-day spelter is barely worth 21*l*., and the red metal is down to about 64*l*. When it was seen that the market was well on the downward grade, the brassmasters, in 1907, took alarm, for price-cutting was rife among them, and worse was feared, for as soon as it was known that a syndicate was in contemplation, numbers of them, in order to establish the highest possible allotment claims, took orders right and left without much regard to profit. Hence the first act of the syndicate was to decree an all-round advance in brass prices of about 7½ per cent., and afterwards, in the face of a steady retrogression in the value of raw materials, it successfully contrived to hold up the prices of brass so that they left a more than ample margin of profit, at any rate in the protected home market, for the export quotations had of course to follow the general trend of foreign competition. This difference incensed the home consumers, new works, which were opened in Berlin and other towns, refused to join, and in October 1909 the top-heavy trust lost its balance and was dissolved.—*The Ironmonger.*

Copper amalgam, prepared in the cold, and then submitted to pressure through chamois, loses mercury until a residure containing 76 per-cent of mercury and 24 per-cent of copper is obtained. The mercury cannot be removed from this residue even at a high pressure. This amalgam, however, melts at 135° C. and upon cooling practically all of the mercury can be removed by pressure. It has been found that other amalgams, notably those of gold, are changed by heat.

## Notes on the Electro-Deposition of Nickel.

**By Woolsey McA. Johnson.**

It is a well known fact to electro-platers that the use of double salts, "dopes", etc., have a beneficial effect upon depositions and to the nickel electro-platers the question of temperature of the solution is an important one.

The prevalent idea amongst nickel platers is that for good, coherent smooth deposits and thick plates the temperature of the solution must be above 40° C, as such deposits are impossible below this temperature. This idea is not above criticism and the use of a hot solution has many advantages and disadvantages.

It is a self evident fact that nickel must be deposited from an alkaline, or a neutral, or a slightly acid electrolyte and for this reason a higher voltage is required than in the plating of copper which is plated from a highly acid solution. Hence, in nickel plating the cost of power is a very large percentage of the total cost. In fact, power costs from five to ten times more in nickel refining than in copper refining. This voltage can best be lowered by heating the solution as high as possible without causing undue evaporation and consequent creeping of the nickel salts.

If a cold solution, below 40° C., were desirable and a working current density of say from 15 to 30 amperes per square foot were used so as to cut down the interest charges on the metal tied up in the vats, it would be necessary to instal refrigerating pipes about the storage vats to obtain the desired low temperature. The electrolyte in the vats warms up due to the heat generated by the resistance offered by the electrolyte to the flowing current.

The use of a hot solution has the advantages therefore, of reducing voltage hence power consumption, the use of a high current density, and to facilitate circulation. The advantage of the use of hot solutions in making tough deposits has been known to practical electroplaters for some twenty years. In fact a Bristol, Conn., plater was using it practically in 1888. There are several secret "dopes" which aid deposition to a very marked extent even when a small amount is added say one part in a thousand. The excellency of the Balbach nickel cathode is well known. Their formation was partly due to the use of a hot solution, which was unavoidable of course, but more especially to the use of a very different "dope" which is kept secret by the discoverer Mr. William Thum.

Hot solutions tend to become cloudy or turbid and a turbid electrolyte always means "warty," poor deposits. The turbidity is caused by the presence of suspended particles of any kind from the anode slimes. These particles have in few cases a conductivity exactly equal to that of the deposited metal. The basic salts of iron, cobalt, and nickel which are insulators have their reaction velocity hastened by the hot solution. When these basic insulating salts adhere to the cathode they cause a distortion locally of the electrochemical field. The lines of force are shunted about these particles building up the deposits at the outer edge quite rapidly as the current density is greatest there spoiling the deposit by making it porous and brittle; and in the case of thick deposits "warty", and poor. A hydrogen bubble will cause the same trouble. The suspended particles can be removed by filter press or by running the electrolyte through a filter or by allowing the particles to settle in an outside vat.

To show that nickel can be plated from a cold solution let it here be remarked that the best piece of deposited nickel the writer has ever seen was on the wires suspending a plater's basket. It was three-quarters of an inch thick, hard as steel and shone with a dull silver finish. A small current density was used and this caused the excellent deposit. The deposit was made from a cold solution.

The reason why nickel deposited at high current density will not "curl up" will now be considered.

Many metals have the capacity to occlude gaseous hydrogen or "nascent" electrolytic hydrogen. This occlusion greatly modifies the magnetic physical and electrochemical properties of these metals. Nickel made by reducing the oxide briquettes with some form of carbon is porous and will absorb 165 volumes of electrolytic hydrogen when placed as a cathode. It will thus be seen that electrolytic nickel, to be exact, nickel hydride, is deposited under considerable electrochemical stress. The molecules of the nickel hydride are in a state of abnormal strain—something similar to the strains of the molecules in tempered steel. The following evidence will prove this physically. An 18″ x 12″ malleable nickel cathode sheet was placed in a groove in the end of the vat which was 12¼" wide and nickel deposited electrolytically upon the sheet. The groove was made of slats ½ x ½ inch in cross-section, nailed to the vat. The exposed surface was 18 x 11⅛ inches. At the end of six days' deposit out of a hot solution, the electrolytic sheet, still adhering to the soft sheet, was wedged in so strongly that two men were required to pull it out. The whole sheet is now elastic.

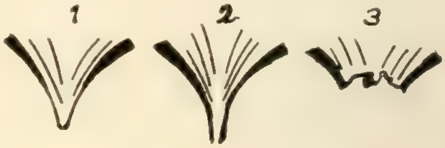
If a piece of stiff paper is wetted upon one side and allowed to stand it will curl up. If allowed to stand longer it will uncurl. The surface wetted becomes soft as did the annealed electrolytic nickel become soft. The other side is as elastic as electrolytic nickel is elastic. Unequal strains are set up which caused the sheet to curl. When the annealing action of the water soaking through the sheet makes the whole limp, these strains are equalized and the sheet uncurls.

Precisely the same thing happens in the electro-deposition of nickel. There is an unequal strain between the inside and outside layers causing the curling up. When deposited, the inside layer has the same abnormal strain as the outside layer, but with time this tension will have become more normal by the slow annealing action of the nickel hydride in the case of the inside layer while in the outside layer the molecules have not had sufficient time to adjust themselves hence the tension is greater on the outside than within and hence the curling. It will be noticed that the curling is always such that the outside layer (or last deposited) is on the concave side of the bending.

It has been observed that nickel will curl when the temperature of the electrolyte is 60° C. if the current density is too high or if the deposit is made on heavily oiled or graphitized surface. Evidently there were parts of the surface where the nickel was thin and the layer could not have been uniform causing lines of weakness where the nickel cracked and curled off. The higher the current density the greater will be this strain. Nickel will often stick to a clean surface, when it will curl up in a few hours from the same surface when oiled. Nickel will stick to a matte or rough surface when it will curl up from the same smooth surface. If the proper "dope" be added to the solution, nickel will have a remarkable hardness and toughness. Mr Thum took one of his cathodes ⅛" thick, placed it against a strong wood frame, and fired at this point blank with a Winchester rifle. The bullet was stopped by the nickel cathode and drew out a long cone at the end of which was found what was left of the bullet—nothing. I append a sketch and a description by Mr. William Thum.

The explanation of the use of double salts is quite evolved and will be omitted. Let it suffice to say that the use of these double salts makes a higher voltage necessary and this additional power sort of "hurls" the deposit making it very firm.

It is trusted that this paper has shown how it is possible to overcome one of the most perplexing difficulties encountered by nickel platers viz., that of having no particles in suspension in the electrolyte and the reason therefor. It is frequently as important a fact to have the electrolyte clear as to have it of suitable chemical composition in order to obtain a smooth deposit as has been pointed out by Prof. C. F. Burgess.



The annexed cut shows in the first figure the effects of firing on the nickel plate referred to. The second figure shows the effect of a higher power bullet on the same plate; the exit hole was smaller than the calibre of the bullet. The third figure shows the effect of a similar bullet on an ⅛" iron boiler plate.

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Crucible lids are not extensively used in melting brass in crucibles as it has been found that a covering of charcoal is preferable and that the lids are superfluous. In steel melting, the lid is invariably used.

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Arsenic finishes, at one time used very extensively on ornamental goods, are now employed with caution. Unless lacquered the arsenic fades within a short time on account of its oxidation to the white oxide, when exposed to the air, particularly that which is damp.

## Some Chemicals Used in Electro-Plating.

### Yellow Prussiate of Potash.

Yellow prussiate of potash is the old name for potassium ferrocyanide and is used in electroplating but practically in one solution only and that is what is known as the "salt water gilding solution" now growing in favor for gold plating all kinds of metals. There are other formulas for plating and coloring with the yellow prussiate, but they are not used ordinarily and it really may be said that the salt water gilding formula is the only plating formula in which yellow prussiate of potash is commercially used. The name yellow prussiate of potash, although not the modern chemical term is the one used in the chemical trade and in the electroplating industry.

Crystals of Yellow Prussiate of Potash.

Yellow prussiate of potash occurs in commerce in yellow crystals as shown in the photographic reproduction shown herewith. They are often of considerable size, an inch or more across, and when perfectly formed, are quite interesting. The color is canary yellow and the crystals are transparent. It is quite easy to recognize yellow prussiate of potash on account of its color and shape of crystals. There is another characteristic of this substance and that is its "waxy" appearance. Unlike other crystalline salts it does not have the vitreous or "glassy" surface, but it is waxlike, although not dull. This "waxy" appearance serves in many instances, together with the color, for its immediate identification.

Yellow prussiate of potash is made in the following manner: Caustic potash is melted in an iron kettle and a mixture of iron filings and some animal substance, like horn or leather, is added to it. The reaction which occurs produces yellow prussiate of potash together with iron sulphide and some other by-products. The mass is dissolved in water and filtered, after which the solution is evaporated and crystals of the yellow prussiate of potash obtained.

Chemically yellow prussiate of potash is closely allied with potassium cyanide and is used for making it, although not extensively at the present time. Formerly all potassium cyanide was made from yellow prussiate of potash, but cheaper methods have taken its place so that very little is now made from it. Yellow prussiate of potash consists of potassium, cyanogen and iron. Roughly speaking, it may be said that yellow prussiate of potash is potassium cyanide with the addition of iron, and the chemical name, potassium ferrocyanide indicates it (ferrum being the Latin word for iron).

As previously stated, yellow prussiate of potash was formerly used exclusively for making potassium cyanide and the process is known as "the old method." The method used was either to heat the yellow prussiate of potash alone in an iron kettle, or to heat it with the addition of carbonate of potash, which gives a better yield. The mass is heated until it melts. The fused material obtained is treated with water and filtered to remove the iron which separates out and the solution of potassium cyanide, now obtained, is evaporated and the mass fused. Fused potassium cyanide is thus produced.

Unlike potassium cyanide, the yellow prussiate of potassimu is not a violent poison, but if taken in sufficient doses it acts as such. It is not considered as a poisonous material on this account and, in this respect it is placed in the same class with sulphate of copper, zinc salts etc., all of which, of course, are poisonous in one sense, but not strongly so.

Yellow prussiate of potash is a poor conductor of electricity while potassium cyanide is an excellent conductor, and, therefore, when it is used for plating, as it is in the salt water gilding solution, some conducting salt must be used in the bath.

There is also another substance called "red prussiate of potash" which occurs in dark greenish red crystals. These crystals, however, are needle shaped and unlike those of the yellow prussiate. The color, of course immediately identifies it. Yellow prussiate of potash consists of potassium, cyanogen and iron like the yellow prussiate, but the iron is in the ferric form. It is not used, as far as known, in electroplating and whether it can be used for salt water gilding is unknown. It is more expensive than the yellow prussiate

## Aluminum in India.

The chief centers of the aluminum industry in India are Madras and Bombay, but it is probable that it will extend by a rapidly increasing number of small establishments to various towns throughout India. Such small existing establishments are chiefly near the eastern coast between Calcutta and Madras. The local working of aluminum was first started in the Madras School of Arts in 1898. Since then a considerable business has developed, and in 1903 it was taken over from the Madras School of Arts by the Indian Aluminum Co., which now has a paid-up capital of about $226,000. This private company possesses completely equipped workshops in which manufacturing operations are carried on by the most modern processes available for working in ductile metals.

## Soldering Fluid as a By-Product in Precipitating Gold From Cyanide Solutions.

**By L. B. Pratt.**

In connection with the recovery of gold from old gold plating solutions, I have found that another operation can be conducted at the same time with scarcely any trouble and expense.

The gold is recovered in the usual way by adding zinc shavings or sheet to the solution, which is heated to hasten the operation. The next step is to pour off the old solution after it has been ascertained that all the gold has been precipitated. The precipitated gold and some zinc are left.

The next step is to dissolve the zinc in some kind of acid and leave the gold. While there are a number of different kinds of acid that can be used, hydrochloric is the best. After the zinc has been dissolved, the gold is filtered and is left on the filter paper. The zinc has dissolved in the hydrochloric acid and will run through the filter paper and consists of zinc chloride. This zinc chloride can be used as a flux in soft soldering, assuming, of course, that all the zinc the acid will take up is used. It costs practically nothing to save this zinc chloride.

## Hardness and Specific Resistance of the Nickel and Cobalt Alloys.

The hardness and specific resistance of the nickel and cobalt alloys have been tested by R. Ruer and K. Kaneko in *Ferrum*, 10, 1913, page 257. They found that in a series of alloys of the two metals in fourteen different samples, varying from 0 to 100 per-cent, the following results were obtained:

The specific resistance increases to a maximum at from 15 to 20 per-cent cobalt, and then steadily falls to that of pure cobalt, when it is slightly lower than that of pure nickel.

The hardness of the alloys remains nearly constant up to 70 per-cent cobalt, when it suddenly increases to that of 80 per-cent cobalt, thence remaining nearly constant up to pure cobalt. It is inferred, therefore, that cobalt is equally as hard as any of the nickel and cobalt alloys and is much harder than pure nickel.

## Red Copper Compound and What It Is.

Several years ago a material called "red copper compound" made its appearance in the plating trades and its use seems to have grown to a considerable extent so that now many platers are making copper and brass plating solutions with it. It was claimed that it produced superior results in brass and copper plating and that the deposit would be found clean, uniform and free from blisters. Many platers found that it would give them better results than they were obtaining in the regular way and for this reason have continued to use the compound in their work. While it is admitted that excellent results can be obtained by the use of the red copper compound, it has been found that equally as good results can be produced by the use of carbonate of copper in conjunction with the bi-sulphite or the sulphite of soda. The red copper compound owes its value to the fact that it is a sulphite, and when used in a plating solution supplies the necessary sulphite of soda or sulphite of potash (depending upon whether potassium or sodium cyanide is used).

Red copper compound is a sulphite of copper and chemically speaking it is cuprous sulphite. Copper, when present in its compounds, exists in two forms, viz: The cuprous and the cupric state. The cupric copper compounds are nearly all green or blue, while the cuprous compounds are white or red. Ordinary copper sulphate is, chemically, cupric sulphate. The red copper compound is the cuprous form and is red. In color it is not unlike the so-called red oxide of copper, which is a cuprous oxide, but it has a lighter color and a granular or finely crystalline appearance. When it first made its appearance on the market, it was thought to be the red oxide of copper and many platers purchased this material, but it was found insoluble in cyanide and hence could not be used.

The red copper compound, cuprous sulphite which it really is, can be made in the following manner:

Make a strong solution of sulphate of copper in water and heat nearly to boiling. Then add a strong solution of bi-sulphite of soda to it. The red copper compound will be thrown down. Allow the precipitate to settle and pour off the clear liquid. The red compound may now be filtered out, washed with clean water and dried.

As the red copper compound is cuprous sulphite it will readily be appreciated that the same results can be obtained in a cyanide plating solution by the use of sodium sulphite or sodium bi-sulphite in conjunction with the regular carbonate of copper. The same is true of a brass solution. The regular amount that is added is about 2 oz. to a gallon of plating solution, but a larger quantity does not appear to injure it.

The advantage of a sulphite in a cyanide plating solution, whether it is copper, brass or gold, lies in its effect on the character of the deposit. It prevents the deposition of the so-called sub-salts along with the metal and gives a clean, uniform metal. It will not prevent blistering of the deposit, but it will lessen them. Blisters usually depend upon the current density and the accompanying amount of gas given off.

## Rare Metals in Blister Copper.

Some copper ores contain considerable quantities of the rare metals and it has been the practice of many copper refiners to save them. The electrolytic refining process has made this possible. In a recent paper on the subject in the *Transactions of the American Institute of Mining Engineers*, A. Eilers gives the amount of these rare metals obtained from a number of varieties of copper. One of the most interesting is the copper from Garfield, Utah. It contained as follows:

In 5000 Tons of Copper

| | |
|---|---|
| Gold | 14,400 oz. |
| Silver | 174,000 oz. |
| Platinum | 17 oz. |
| Palladium | 59 oz. |
| Selenium | 2,800 lbs. |
| Tellurium | 277 lbs. |
| Bismuth | 305 lbs. |
| Nickel | 2,000 lbs. |

Selenium was present in all the varieties of copper examined and was nearly always greater in amount than the tellurium. Some of the copper contained no tellurium at all.

The so-called "tempered-copper" of the ancients was, in reality, bronze as the copper was alloyed with tin to harden it.

## Use of Boron in Making Bronze Bearings.

The use of boron in making bronze bearings has recently been patented* by Edward D. Gleason of New York City and assigned to the Plastic Metal Co. Inc., of Brooklyn, N. Y. It is claimed that the use of boron will overcome the "sweating" of the lead and tin in the castings. The invention is described by the author as follows:

"My invention relates to plastic alloys including lead, copper and tin, which may be advantageously used in the manufacture of bearings for shafts, etc.

It is an object of my invention to provide such alloys free from "lead sweats" and segregation, which are defects usually found in such alloys due to lack of affinity of the lead for the copper or copper and tin, and the high specific gravity and low melting point of lead, for, at best, such alloys are but mechanical mixtures wherein copper is held in a finely divided state in a matrix of lead

Another object of my invention is to provide such alloys including a given percentage of copper but of different degrees of hardness.

The effect of my improvement is to provide an alloy which is homogeneous in that the copper therein is comminuted to the greatest possible extent and equally distributed throughout the mass of the alloy

In practising my invention, I incorporate boron in copper, as graphite exists in cast iron; such a boron copper product and a method of producing it being the subject matter of another application Serial 731,863 filed November 16, 1912 for Letters Patent of the United States. Such boron copper is harder than ordinary copper and by its employment in varying percentages I am able to make copper-lead-tin alloys which are alike in total percentage of copper but different in degrees of hardness. For instance, an alloy in accordance with my invention may contain 50 parts of boron copper and would be much harder and more brittle than another alloy, in accordance with my invention, containing 50 parts of copper if the latter is an aggregate of ordinary copper and boron copper. In other words, diminishing the percentage of boron in the alloy diminishes the hardness and brittleness thereof, and variation in this respect is conveniently effected by employing more or less of the boron copper, to wit, the copper containing boron, with more or less copper devoid of boron. In any case I prefer to proceed by first melting the copper, with suitable appliances, and adding the lead and tin thereto when the copper is in the fluid state, and, then stirring or otherwise agitating the mixture before pouring it into ingot molds All of these products are free from lead sweats or segregation and have an unctuous anti-frictional texture and a surface resembling planished copper; properties which are advantageous in bearings, piston rings, gaskets and steam packing.

In making alloys of copper, lead and tin the tin will segregate if not in the proper proportion for the copper and lead. For instance, if copper 67 parts, lead 24 parts and tin 9 parts are mixed in accordance with ordinary foundry practice, the lead will sweat out and form in little pools and the tin will segregate and stratify. On the contrary, by the employment of boron copper as above contemplated such alloys of copper, lead and tin may be made entirely homogeneous and of any desired degree of hardness."

## Bad Effect of Charcoal in Aluminum Melting.

While charcoal is very beneficial and really necessary in melting the brasses and bronzes, it is very detrimental in melting aluminum alloys. It is not uncommon, even at this late day, to find that some brass founders, who have not had much experience in aluminum, use charcoal on aluminum when melting it. It is needless to say that their castings are bad.

The disadvantage of charcoal in melting aluminum is on account of the fact that it does not separate from the metal, but, owing to the lightness of the aluminum it mixes with it to a greater or less extent and cannot be entirely removed when the metal is skimmed. Aluminum, particularly at the furnace is more or less thick and pasty, depending upon the amount of oxide formed in melting and the charcoal becomes entangled in the metal and does not free itself. It is impossible, therefore, to remove all the charcoal in skimming and the result is that small particles are found in the aluminum castings

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*U. S. Patents, 1,066,403 and 1,066,428, July 1st, 1913.

## Coloring Metals Black by Means of Smoke.

By means of smoke it is possible to color all metals a dead black or, in other words, as black as the smoke itself. The use of such a method is frequently employed in decorating art metal wares such as lamps and fixtures, and by its skilfull management some very fine effects may be produced. The shading which can be obtained by it cannot be equalled by any other method. Such shading, however, requires very much skill in the manipulation of the article to produce the effect and a novice will usually find it difficult to imitate it at first. Those who desire new and novel finishes, would do well to try it. It will produce a finish not to be obtained by any other process.

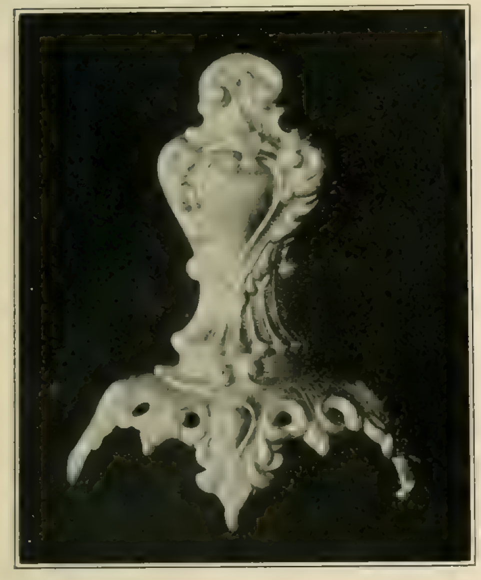

Fig. 1. Article Before Blackening.

The object of this article, however, is not to describe the various artistic smoke finishes that can be obtained: but to show that it is possible, by the simple use of smoke to color the surface of any article entirely black and with an even finish that is actually black. It can be used on all metals: Aluminum, soft metals, brass, copper, tin, zinc, etc.

The coloring is done by any smoky flame, the more smoke the better, and by holding the article to be colored in the flame itself. As soon as it is colored, the operation is stopped. By this means it is possible to color certain portions or all the surface of an object, but relieving is not satisfactory on account of the softness of the smoke deposit. It is, of course, nothing but lampblack and cannot be handled after it has been deposited on the article, on account of this softness While being smoked, the object must be held with tongs, forceps or a wire.

Now comes the peculiar part of the process, and that is the "fixing" of the smoke. This is quite simple and is done by dipping the smoked article in lacquer. Strange as it may seem, the lacquer covers the black soot on the surface as easily as it does metal and binds it fast on the metal. Dip lacquering must be used as brushing, would remove it, but small articles, comparatively speaking, may be dipped in the lacquer without any difficulty, and when it is done, the lacquer is not disturbed at all.

By adjusting the character of the lacquer the character of the surface may also be modified. If the lacquer is thin or flat, the surface will also be flat, but if heavy bodied, the surface will be glossy. Two or more coats, if desired, may be put on by dipping.

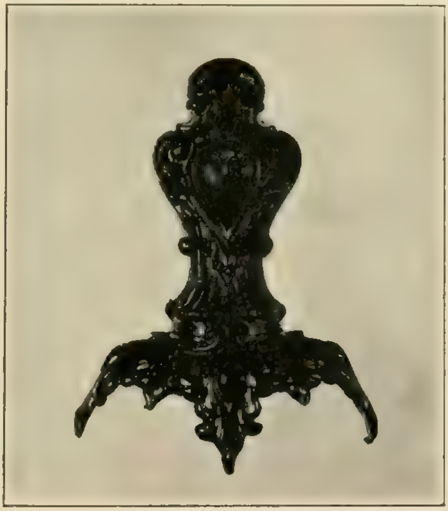

Fig. 2. Article After Blackening by Smoke and Lacquered.

This method of coloring metals is inferior to that produced by the use of the well known black lacquers, but it may be used in instances where no black lacquer is at hand, or for the modification of the surface by the partial application of the smoke. It is well to know that smoke may be used for blackening metals, and the remarkable fact of the process is that lacquer flows over it so readily and binds it firmly without dislodging the least particle from the surface. In addition, it may be said that a brown-black finish may also be obtained by means of the smoke when only a small quantity is used for coloring the metal surface. It is difficult, however, to color the entire surface with the brown shade evenly, but when shaded from the brown to the black some very beautiful effects may be produced.

## Impossibility of Cheapening Tinning Process by Adding Other Metals.

The abnormally high price of tin has caused manufacturers of tinplate to seek some substitute which will cheapen the method of production. This problem is referred to in a recent number of *Der Eisenwarenhandel.* The merit, it is stated, of a good tinning of iron or steel consists not only in the fact that the metal is protected against rust, but also that a bright, shining coating is produced which will remain unchanged after long exposure. So far it has been impossible to cheapen the process and to maintain the quality at the same time. The first efforts in this direction consisted in the admixture of lead with the tin. Iron or steel goods can be tinned with such an alloy, even when the lead is in a large proportion. The coating is, however, dim under these conditions. Even with an addition of only 1 per cent. of lead the coating does not remain so long unaltered on exposure as the pure tin, while the colour also is somewhat different. Of course, the coating of such tin is cheaper, owing to the admixture of lead. Such a coating should not be, however, be selected if a shiny surface is desired which shall remain for a reasonably long time unaltered on exposure. Moreover, the hygienic aspects of the question should be considered. It is well known that a large number of tinned vessels are used for domestic purposes in which they come into contact with food. Such articles should in no case have any lead in the tinning, for under such circumstances the possibility of poisoning is not excluded. Lead can only find an application with particular advantage in special cases, and they are of minor importance.

Various experiments have also been made in mixing zinc with the tin, but the results were also negative. The zinc makes the tin more or less pasty in melting, while the coating is not so white and shiny. For these reasons zinc is not applied for tinning.

The addition of antimony, even in small quantities, has equally bad results as that of zinc. The amount of antimony which can be added to the tin without the coating becoming dull is so little that the application of antimony is worthless. Aluminum has been tried, but again no favourable results have been attained. The addition of the latter makes the coating adhere less firmly to the metal, and a good surface cannot be easily obtained.

All these trials have only led to one conclusion, that a bright, shiny, and lasting coating can only be produced on iron or steel by using pure tin. The coating is particularly unfavourably influenced by the addition of other metals, especially as regards appearance.

## Correspondence.

### Diseased Lead.

*Editor,*

The article in the July issue of *The Brass World* on page 256 entitled "Diseased Lead" is very interesting. It brings to our minds a very peculiar experience which we ourselves had.

In our plating department we have a number of lead lined tanks, the lining of which was properly tested before using and found practically chemically pure. Some time ago, we filled one of these tanks with about 150 gallons of freshly distilled water, preparatory to making a copper solution. The dissolving of the salt and preparation of the bath were delayed for a couple of weeks, and in the meanwhile the tank containing the water was covered up.

Much to our surprise, when we eventually started to prepare this bath, we found a white deposit entirely covering the lead lining. A number of experiments proved this white substance to be lead carbonate.

It is quite evident that the carbonic acid gas in the distilled water attacked the lead lining, thus developing the peculiar paradox that a metal that is practically proof against most all of the strong acids, can be affected by a fluid so pure and apparently innocent as distilled water.

*H. S. Berliner,*
*Berliner Gram-o-phone Company.*
*Montreal, Canada.*
*July 18, 1912*

## Melting and Alloying Aluminum.

At the meeting of the British Foundrymen's Association, held in London on June 21st, C. H. Ivinson read a paper on the alloying of aluminum. He stated that pure aluminum, on account of its softness, is unsuitable for engineering purposes.

For general work the alloys of the metal were more important. The indiscriminate use of metals to form aluminum alloys had given the latter metal a bad reputation. Aluminum alloyed with every known metallic element, accompanied by disengagement of heat, and was particularly active in combining with copper. Most of the alloys were chemical combinations of the metal, rather than mechanical mixtures, the alloys with lead, antimony, and mercury being exceptions.

The useful alloys of aluminum seemed to fall in three groups, viz.:

(1) Aluminum containing not more than from 10 to 25 per cent. of added metals.

(2) Metals containing not more than from 10 to 15 per cent. of aluminum.

(3) Alloys of rare metals with aluminum containing from 0.5 to 5 per cent. of added metals.

In order to make aluminum harder, stronger, and of better wearing properties, at the same time keeping its valuable lightness and beautiful colour, it was alloyed with small percentages of such suitable metals as manganese, zinc, tin, copper-nickel, etc. He had alloyed aluminum with almost every metallic element, some of the results being only curiosities, the cost of production making them of no commercial value.

Zinc was the cheapest known hardener of aluminum, and in quantities of up to 15 per cent. combined to increase the rigidity and strength of the aluminum. Tin, when alloyed alone with aluminum, appeared to develop brittleness, and alloys of 15 per cent. of tin and aluminum had been known to disintegrate in the course of a few days. Nickel by itself produced unstable alloys, but the introduction of a third element, such as copper, was an advantage. Phosphide of copper, added in quantities of 1½ per cent. to a zinc-aluminum alloy containing from 12½ to 15 per cent. zinc, gave fluidity to the molten metal. Phosphide of zinc containing 25 per cent. phosphorus might be substituted in the proportion of 0.05 per cent. That was one of the best fluxing and cleansing agents known for all aluminum alloys, and should be added to the molten alloy for a few minutes before pouring by wrapping in paper and plunging to the bottom of the crucible by means of tongs.

Magnesium-aluminum alloys containing from 1 to 10 per cent. magnesium were much improved by the addition of 5 per cent. zinc, as that addition imparted better wearing properties to the metal. By the addition of 1 per cent. phosphide of copper less oxidation of the metal took place during the melting operations.

### *How Alloys Deteriorate.*

The alloys of copper, nickel, magnesium, and zinc had good tensile strength when newly made, but in the course of time chemical and electrolytic actions rendered some of them brittle, and in some cases led to the entire disintegration of the alloy, especially if iron, sodium, and silicon were present as impurities. Aluminum was liable to take up silicon from the crucible, especially if overheated. It was important that those alloys should be melted without fluxes—fluxes such as mixtures of sodium and potassium chloride. Zinc chloride acted on the crucible, thereby causing the aluminum to wet the sides of the crucible and dissolve out the silica, which in the presence of moisture liberated silicon hydride, causing, in time, the disintegration of the alloy. Too much stress could not be put upon the fact that the metal must be melted at as low a temperature as would cause the metal to become fluid. Aluminum absorbed sulphur at a bright red heat, and the gas was liberated when the metal was poured into the moulds, causing porous and "blow-hole" castings. Aluminum alloys should always be melted in crucibles having good, tight-fitting lids to prevent, to some extent, the absorption of sulphur from the fuel used. Numerous tests had led him to form an opinion that silicon and sulphur were deadly enemies of aluminum alloys, especially when the metal was overheated.

In making an alloy of aluminum a concentrate of the metal which was to be alloyed with the aluminum should first be prepared, say, a 20 or 25 per cent. concentrate metal, and that could be added in the proper proportions to the molten aluminum.

### *The Effects of Rare Metals.*

With regard to the rarer metallic elements, such as cerium, neodymium, lanthanum, tantalium, zirconium, and beryllium, some of them gave most remarkable results, even in quantities of only 1 per cent. and under. Cerium and beryllium were particularly interesting, 0.5 per cent. of cerium exerting a most wonderful effect on the aluminum, raising the tensile strength of the metal from 4.5 tons per sq. in. to 10.3 tons per sq. in., and giving an elongation of 8.5 per cent. on 2 in. Another interesting alloy was one of beryllium or glucinum. An alloy of 2 per cent. of beryllium gave a tensile strength of 11.8 tons per sq. in. with an elongation of 10 per cent. on 2 in. It was of a beautiful silver-white colour, and could be hammered out cold into leaf; it also withstood the action of sea-water perfectly.

Alloys of manganese, titanium, chromium, molybdenum, and tungsten formed an interesting series, either when alloyed by themselves or in the presence of copper. Titanium and chromium alloys were both attacked by sea-water and ordinary atmospheric conditions, but the tensile strength of the one containing 2 per cent. of metallic titanium was 10.4 tons per sq. in., and the elongation 4.5 per cent. on 2 in. The alloy with chromium, containing 1.5 per cent. metallic chromium, had a tensile strength of 9.34 tons per sq. in., with elongation of 2½ per cent. on 2 in.

### *Discussion.*

Mr. A. Hayes (London) asked the author if he had met with instances of aluminum alloys which disintegrated after two or three years, although quite sound and strong when fresh made. He had come across such examples. The change, in fact, resembled the "tin pest." The action occurred in a perfectly dry atmosphere. Perhaps the author could throw some light on the matter.

Mr. Ivinson, in reply, said he believed electrolytic action was at the root of the trouble, and gave some further instances. Thus the addition of titanium up to 50 per cent. gave strong alloys, but they were all subject to rapid corrosion. If an alloy were made with 2 per cent. of titanium, polished, and placed in sea-water, it developed spots, which, on examination, were seen to be small corrosion pits.

Chromium can be deposited electrolytically, but as far as known no use has been made of the deposit.

## The Use of Carbonate of Soda (Sal-Soda) in Brass Plating Solutions.

Carbonate of soda is used in brass and copper plating solutions to increase the conductivity. It seems to have no other value. Some platers use it and some do not, but it will be found advantageous, however, particularly in barrel work where the greatest possible electrical conductivity is necessary.

The advantage in a conducting salt in a plating solution is that it takes less voltage for a given number of amperes to pass and thus the cost of current is reduced. It also prevents the solution from heating up as readily, and in addition it causes a more even electrodeposition of the metal. A conducting salt should be an inert one and have no other value. Carbonate of soda seems to answer this requirement.

Some experiments were recently made* to determine the effect of carbonate of soda on a brass plating solution. An ordinary brass solution, containing nothing but the carbonates of copper and zinc dissolved in cyanide, was employed for the test. This stood about 15 degrees Baume and contained about 5 oz. of free cyanide. When tested alone, 5 volts caused 2 amperes to pass while 3½ volts gave 1 ampere.

To the solution were then added 2 oz. per gallon of carbonate of soda (sal-soda) in crystallized form. The following results were obtained on this solution:

With 5 volts, 2¼ amperes were flowing, while with 3½ volts, 1.3 amperes passed. The appearance of the deposit seemed equal in each instance.

The effect of the carbonate of soda in a brass solution therefore is to increase the conductivity, and 2 oz. of the carbonate of soda in a gallon of brass plating solution, increases the conductivity approximately 25 per-cent.

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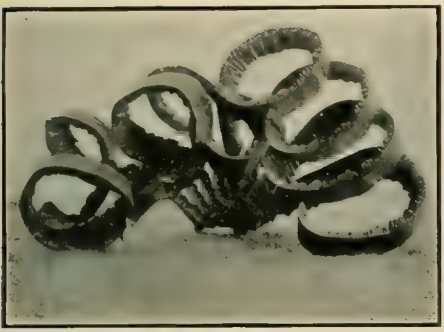
*Made in the experimental labrotary of THE BRASS WORLD.

Nickel deposited from a solution that is alkaline with ammonia will have a dark color and show a tendency to peel and flake off. With a strong current it will frequently peel in the solution. Nickel solutions slightly acid or in a neutral condition do not show this phenomenon.

## A Peculiar Aluminum-Bronze Chip.

Aluminum-bronze is cast for rolling in an open mold in the same manner as copper and the top is then planed off to a depth of a half inch or so to remove the dirt and dross and produce clean metal. The planing is done on an ordinary planer.



A Peculiar Aluminum-Bronze Chip.

In planing a 4 x 12 x 2 inch plate, the feed was not set right so that the tool did not quite remove the chip after each cut and several cuts were obtained before it was noticed. The result was a peculiar shaped chip as herewith shown. The plate was composed of a 5 per-cent aluminum-bronze and the form of the chip indicates the toughness of the metal.

## Coloring Copper and Copper Plated Articles.

In a German patent has recently been issued to C. Dittrich a method of coloring copper is claimed. The copper or copper plated article is coated with lead by electrodeposition and then immersed in a bath of melted potassium nitrate (nitre) or potassium nitrite. The surface is buffed off leaving the red color underneath.

The result obtained, of course, is the so-called "Royal Copper" finish and the metal has been in use in the United States for some ten years; in fact, it was published in THE BRASS WORLD in 1905.

One of the best known fluxes for all metals which melt above a red heat is borax. It melts to a glass and has the property of dissolving metallic oxides, thus purifying the metal upon which it is used.

## How Much Zinc Can be Used In Yellow Brass for Sand Castings.

As the object of using yellow brass for making sand castings is its cheapness, and as zinc is the cheapest constituent of the brass, it is natural that brass founders should try to use as much zinc as possible in their mixture. The exact limit of the zinc content in the brass depends upon the character of the castings and more can be used in some kinds than in others. For small castings which are not to stand pressure, more may be employed than in larger castings, particularly if they are for the manufacture of plumbers' brass goods. It may be said, however, for the general run of brass castings, the amount of zinc in the yellow brass should not be over 33 per-cent, or in other words the brass should not be over a 2 and a 1 mixture. For small castings a little more zinc may be used but it will usually be found more profitable to adhere to the 2 and 1 mixture and obtain a greater proportion of good castings.

The disadvantage of an amount of zinc in yellow brass greater than 33 per-cent is that the castings will come dirtier on account of the formation of a larger quantity of dross. For work to stand pressure, and nearly all plumbers' brass goods must do it, this dirt or dross means leakage. Even with the amount of zinc that is present in a 2 and 1 mixture, there will be more or less loss on account of leakage, and far greater than would be the case were red metal to be used. By lessening the quantity of zinc, a greater proportion of good castings can be obtained, and the less zinc that is present in the mixture the better the castings. It might be thought that it would be more economical to use a considerably less quantity of spelter and then obtain a greater quantity of good castings. This change would be open to two objections: First, the cost would more than offset the benefit obtained. Second, if the quantity of zinc is reduced to any considerable amount the brass becomes too soft and this fact has to be overcome by the introduction of a little tin which, of course, considerably increases the cost.

There is another objection to the increase of the amount of zinc in yellow brass beyond 33 per-cent and that is the color of the brass. When it is increased the color begins to change to a reddish one and at about 60 per-cent of copper and 40 per-cent of zinc, the color is more of a golden-yellow. This, of course, would be an objection in some instances but not in others, but it supplies us with a sure and immediate way of ascertaining whether there is an excessive amount of zinc in the brass. If yellow brass castings have not been coming well and an abnormal quantity of imperfect castings have been produced, then notice the color of the metal. If it has a reddish shade, then it will be found that too much zinc is in it. A 2 and 1 mixture has a pure yellow color, free from any reddish shade.

The preceding remarks apply to yellow brass without any aluminum in it as the presence of even a small quantity will entirely alter the matter. By the use of aluminum it is possible to cast brass with any quantity of zinc in it and it is now extensively employed for many classes of goods. Unfortunately, aluminum cannot be used in a yellow brass mixture intended to stand pressure as it causes the castings to leak, and for this reason its use in plumbers' brass goods is prohibited. As this class of goods comprises most of the yellow brass found on the market, the use of aluminum in yellow brass cannot be tolerated for plumbers' brass work.

Yellow brass for ordinary work, therefore, and which is to be used without the addition of any aluminum, should not contain over 33 per-cent of zinc and should have a yellow color. If it has a reddish shade, it indicates that it contains too much zinc.

## Correspondence.

*Editor:*

Question No. 1331 in the July issue of *The Brass World*, page 259, reads, viz: "In what form does tungsten occur on the market?"

Supplementing your remarks on this question, we would say that tungsten is also sold in the form of ferro-tungsten. This is usually delivered in lump form and contains from 80 to 90 per-cent of metallic tungsten, from 10 to 20 per-cent of iron and from 0.75 to 4.00 per-cent of carbon, depending upon the buyers specification.

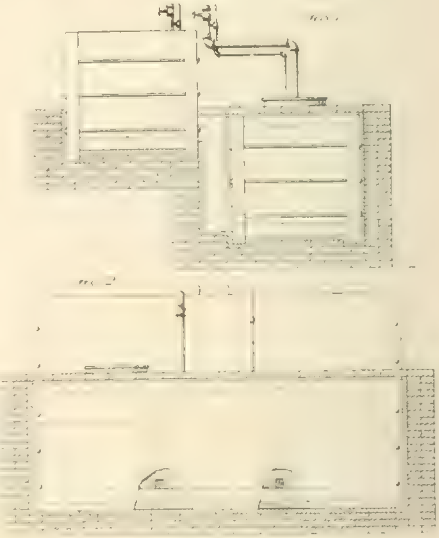
Ferro-tungsten is used chiefly in the manufacture of tool-steel.

*C. W. Leavitt & Co.*

*New York City,*
*July 10, 1913.*

## Use of Two Tanks for Pickling Metal for Galvanizing.

In a patent recently issued to Edward J. Carey of Baltimore, Md., the use of two tanks for pickling metal for galvanizing or tinning is described. The tanks described by the author and herewith illustrated, were constructed for pickling such articles as coal-hods, pails, and similar goods.



**Arrangement of the Tanks.**

One tank is situated above the other so that the pickling solution may flow from the top tank to the bottom by gravity. The bottom tank is closed and a pipe so that air under pressure can be forced connects with it. By this means the pickling solution can be forced from the bottom tank to the top one.

The advantage claimed is that scale left in the bottom of the top tank runs into the bottom one and from which it can be cleaned whenever necessary by removing the hand-hole. The pickle in the top tank is thus kept clean and in good condition, as by flowing into the bottom tank from time to time, the scale is removed from the bottom and the solution is agitated. The pickle, it is stated, is used hot and the heating is carried out by means of a steam pipe in the overhead tank.

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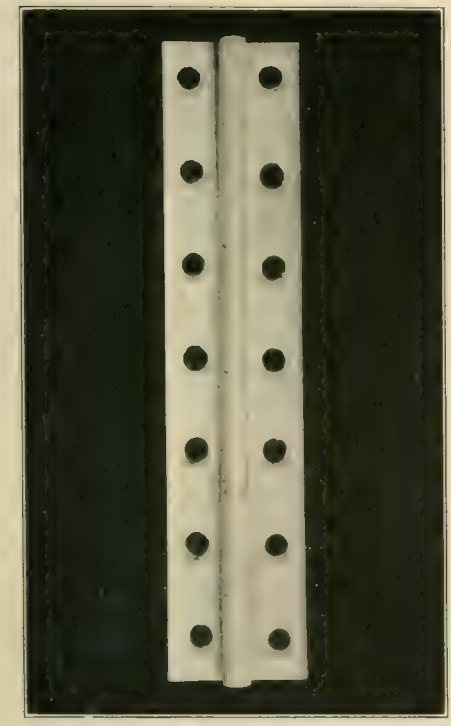
The future tin supply is an important problem in the metallurgical world as the demand for it has greatly increased within the past few years while the supply has not increased proportionately.

## Nickel Plating Zinc.

While the best method of nickel plating zinc is to copper or brass plate it in a cyanide solution and then deposit the nickel, there are occasions when it is desired to nickel plate direct. It cannot be called a very satisfactory process, however, and a number of concerns which previously deposited the nickel directly on the zinc have now abandoned the process and are first brass or copper plating it. In this connection it may be said that a better color is obtained on the zinc if it is brass plated first as the nickel deposit then has a white shade than if copper plating is carried out as the preliminary process. As copper plating is more easily carried out than brass plating, it is the method generally employed and gives good results. First brass plating, however, gives slightly whiter nickel, but not sufficient to warrant the extra difficulty encountered for ordinary work.



Nickel Plated Zinc Hinge.

In nickel plating zinc in the ordinary manner, the difficulty experienced is that the zinc reduces the nickel from the solution by simple immersion without the current being on. This results in the formation of black streaks on the zinc. This is the trouble experienced with all nickel plating solutions when zinc is nickel plated.

Zinc may be nickel plated direct by first connecting the article to be plated to the cathode or work rod and then "striking" it with a strong current, say the full 6 volts of a plating dynamo. This operation results in depositing a film of nickel over the surface of the zinc so that it becomes covered. The deposit will be "off-color," however, and have a yellow shade. Now the current is reduced to the right amount for nickel plating, and the deposition of the nickel carried out. By following this process, the nickel is deposited upon the zinc surface before it has time to reduce it from the solution by simple immersion.

## A Novel Way of Eliminating Oxygen in Copper.

In the Bulletin of the *American Institute of Mining Engineers,* July 1913, a paper by Earl S. Bardwell is given. It is entitled "Notes on the Metallography of Copper" and a novel method of estimating the amount of oxygen in copper is described. The method is as follows:

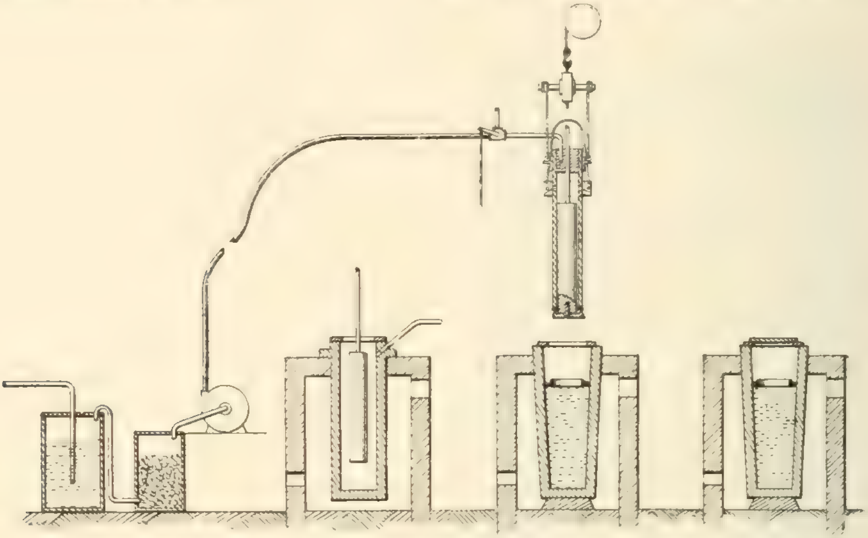
The piece of copper to be tested is polished and etched in the usual manner for examination under a microscope. A microphotograph is then made and the negative used in a stereopticon and an image of the section of copper examined is thrown upon a piece of heavy paper. By means of a pencil, the lines shown on the paper are traced out.

The paper is then removed, and the portions surrounded by the lines are cut out by means of a sharp knife. The oxide of copper portion separates in one portion of the surface and the pure copper in the other. The separate pieces are then weighed on a balance and the proportion of oxygen in the sample is thus obtained. It is stated by the author that the method will check within 6 or 7 per-cent. Rapidity is the feature of the process that is claimed.

Sal-ammoniac is added to nickel plating solutions for increasing the conductivity, but it has another valuable property. Chlorine is set free at the anode and causes it to give off nickel more easily and rapidly

## Production of Copper Coated Steel Billets.

A new process for coating steel billets with copper, particularly those of high carbon steel, has recently been patented by William M. Page of the Duplex Metals Co. of Chester, Pa. These billets are afterwards rolled into rod and drawn into wire producing, of course, the copper coated steel wire. Other metals may be used instead of copper.



Method of Making the Copper Coated Steel Billets.

The improvement embodied in this patent consists of decarbonizing the surface of the steel billet so that the copper will adhere more tenaciously. The steel billet is cleaned by sand blasting, pickling or other means and then subjected to the action of superheated steam which oxidizes the surface. This oxide is then reduced by means of producer gas. A pure iron is left on the surface to which the copper adheres in an excellent manner. The sketch herewith shown indicates the manner of dipping the billet. In the use of the producer gas, any oxygen in it and which would interfere with the complete reduction of the oxide, is removed by passing it through a solution of pyrogallic acid in an alkali.

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Practically no tin is mined in the United States, although the ores have been found in small quantities in the Rocky Mountain states.

## Zinc or Spelter?

The ruling of the Glasgow Stipendiary that sheet zinc is virtually the same thing as spelter (*The Ironmonger*, July 12, p. 45), and therefore a metal which must not be purchased in smaller quantities than 56 lb., shows once again the inconvenience of having more than one name for the same material. It would be interesting to know how the term "spelter" came to be used to designate zinc in ingot form, and also why, when molten zinc is applied as a coating to sheet iron or steel, the product should be described as "galvanised." Such terminological inexactitude is not creditable to us as a commercial nation, and it would be well, I think, if both the word "spelter" and the term "galvanising" (as applied to zinced metals) were dropped out of commercial usage. Our German and French neighbours make no mistake in this matter. With them zinc is "zink" or "zinc," and an article coated with it is "verzinkt" or "zingué," as the case may be. The only objection that I can see to our following the same, and correct practice is that zinc makes rather an awkward adjective in English. "Zinced" looks rather silly certainly, but "zinckt," though not melodious to the ear or beauteous to the eye, would meet the case.—*The Ironmonger*.

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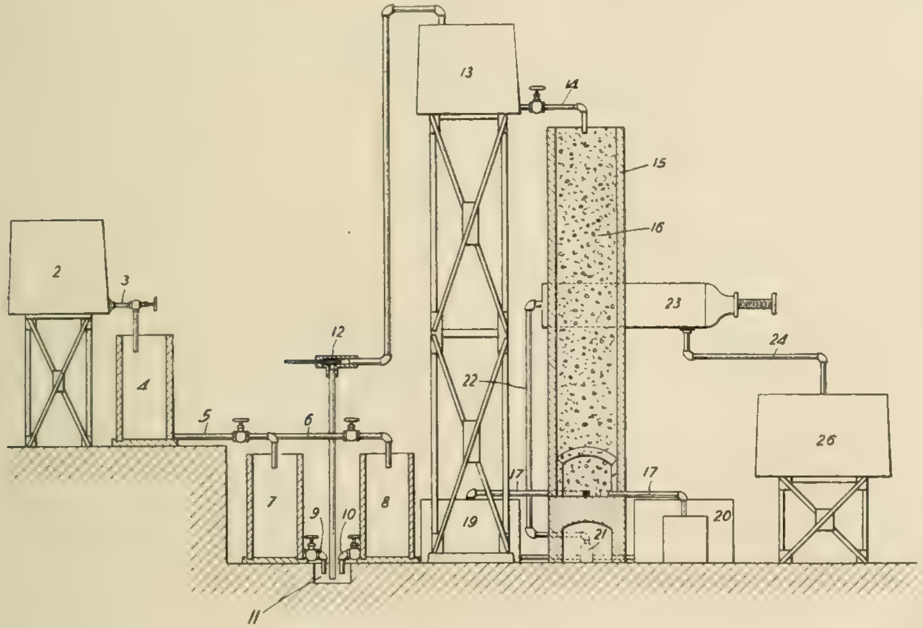
Chromium has the property of hardening all metals and the hardest alloys contain it.

## Removing Zinc From Galvanized Iron Scrap.

Where it is desired to save the iron or steel for re-galvanizing it is customary to dissolve off zinc on defective sheet or articles by means of weak acid. Spent acid pickle is also used. This method, while it removes the zinc from the iron or steel, does not save the zinc, but allows the article to be re-galvanized.

A method of stripping galvanized iron scrap has recently been patented by Joseph McFetridge of the American Sheet & Tin Plate Co. of Vandergrift, Pa. The phocess allows both the iron or steel sheet and the zinc to be saved. The method may be understood by reference to the sketch shown herewith. The different steps in the process are as follows:

The galvanized materials are placed in the vat 4 which contains a bath composed of zinc chloride or zinc sulphate to which two to three per cent. of free acid has been added from the acid tank 2, the galvanized materials being allowed to remain in the vat 4 until the zinc-iron alloy becomes exposed. The so-treated materials are then removed from the vat 4 to one of the vats 7 and 8. Successive quantities of galvanized materials are treated in the vat 4 until the zinc coating is substantially removed, then being transferred from the vat 4 into one or the other of the vats 7 and 8 containing liquor of greater specific gravity (in degrees Baume) and less free acid to be further treated to remove the zinc-iron alloy now forming the surfaces of the partly stripped materials. When the acid content of the bath or solution in the vat 3 has been reduced from between two and three per cent to between one-half and one per cent., a portion of the bath is withdrawn from this vat into one or the other of the vats 7 and 8 to form the bath in such vats. The quantity of solution transferred from the vat 4 to the vats 7 or 8 should equal in volume the amount of acid necessary to restore the acidity in the solution in the vat 4 to its original strength of from two to three per cent. free acid. By following this procedure, the bath is of uniform strength and acidity and the action of the acid on zinc of the galvanized sheet is slow enough to be within control of the operator so that a minimum quantity of the base metal is dissolved and the finished product is of uniform strength and composition. The partly stripped materials as removed from time to time from the vat 4 are placed in one or the



Apparatus for Removing the Zinc from Galvanized Iron.

then in the vats 7 or 8 where they remain until the zinc coating and zinc-iron alloy has been entirely removed from the materials being treated or stripped and the solution with which the vats 7 and 8 are kept filled is used until the acid is satisfied and the bath has become entirely neutralized. As the solution in the vat 4 is maintained with an acid content ranging from between two and three per cent. when freshly replenished to one-half to one per cent. at the time the solution is withdrawn into one of the vats 7 or 8, the zinc coating will be removed more rapidly in the vat 4 than in the bath maintained in the vats 7 and 8, so that the stripping process will be carried out slower in the vats 7 or 8 than in the vat 4. For this reason, the combined capacity of the vats 7 and 8 will be made greater than that of the vat 4 so that the materials removed from the vat 4 can remain twice as long in the vats 7 or 8 in being treated by the second step of the process, and the materials will be finished by the second step as fast as the first step of the process is carried out. Instead of using two vats 7 and 8, as shown, one large vat having a capacity equal to that of both vat 7 and 8 may be employed. The so-stripped plates when removed from the vats 7 and 8 are then washed to remove any remaining solution therefrom and are then in readiness to be again galvanized.

When the solution in the vats 7 and 8 through continued use become neutralized, it is discharged into the well 11 from which it is delivered by the siphon 12 into the storage tank 13, which provides a convenient means by which solution in the tanks 7 and 8 may be removed therefrom at irregular intervals while a constant supply of solution is obtained for treatment in the tower 15. The solution in the tank 13 is discharged into the top of the tower 15 and trickles or flows downwardly through the material with which this tower is packed, and in passing through the tower the solution is brought into intimate contact with the upwardly ascending column of oxidizing gases which are introduced at the bottom of the tower and is oxidized, contact of the solution with the ascending gases changing the iron in the liquor from the ferrous to ferric salts. The oxidized liquor is discharged by gravity from the bottom of the tower and passes into one or the other of the tanks 19 and 20 in which it is treated with zinc carbonate so as to precipitate the iron which is now in the ferric form. This treatment changes the iron into an insoluble form and the treated liquor is delivered from the tanks 19 and 20 to the receiver 23 in which it is decanted and filtered so as to leave pure zinc salts. The zinc salts are then discharged into the storage tanks 25 and 26 from which they are withdrawn when required.

The advantage of my invention will be apparent to those skilled in the art. Instead of the zinc removed in the stripping operations being allowed to go to waste, as heretofore, it is recovered in a form in which it may be readily sold.

By first partly stripping a given quantity of sheets in an acid solution of zinc chloride or zinc sulphate and then completing the stripping operations in a similar solution of greater specific gravity and less free acid and by preventing the first solution from becoming neutralized or its acid content being reduced below a certain point, and using the partly neutralized solution from the first bath in forming the second bath, a substantially continuous operation is obtained and the necessity of reconcentrating the acid is avoided and overcome. By increasing the capacity of the vats containing the second solution, the slower removal of the coating in the later step of the operation is hastened, the second step is performed at the same speed as the first stripping operation, and the operations are equalized or performed at a uniform rate of speed. By first rapidly removing the coating in a strong acid solution and then completing the operation with a weaker solution on a larger quantity of the materials at a slower rate of speed, the amount of iron dissolved in the stripping operations is greatly lessened and largely prevented.

## Lead Alloy for Tapes.

The Western Electric Co. has patented the following alloy in England. It is intended for use in the form of tape for winding electrical conductors:

| | |
|---|---|
| Lead | 95.00% |
| Antimony | 4.50% |
| Tin | .50% |

It is stated that the tape made from this alloy is more economical than pure lead for the reason that the thickness may be reduced one-half and the width may be increased by one-third and the same strength obtained.

## Plumbago Mining in Ceylon.

In the *Daily Consular and Trade Reports,* U. S. Consul Henry D. Baker gives the following information on the mining of plumbago in Ceylon.

Plumbago is Ceylon's most important mineral product, and in the exportation of plumbago the United States is Ceylon's most important customer, purchasing over one-half of the plumbago mined. The Ceylon customs returns show that in 1912 there was a total export of 654,650 hundredweight (hundredweight=112 pounds) of plumbago from Ceylon valued at $2,782,262, of which the United States took 310,255 hundredweight, valued at $1,318,587; Germany, the next best customer, 162,886 hundredweight, valued at $692,265; the United Kingdom 107,595 hundredweight, valued at $457,274; and Belgium, 57,565 hundredweight, valued at $244,642.

Plumbago finds its use chiefly in the manufacture of crucibles for the steel trade. The value of the plumbago is largely determined by the percentage of carbon, while its structure and binding and refractory qualities are also important factors. Ceylon plumbago is known all over the world for its luster, lubricating, polishing, and binding qualities. In appearance it differs from the grayish lead which is found in young rock in America. The more refractory the lead the more suitable it is for crucibles.

There are now about 1,000 plumbago mines in Ceylon, including all the shallow pits, open works, and deep mines. There are probably between 200 and 300 mines proper, the rest being shallow workings which last only a few months and are then abandoned. The depth varies from a few fathoms to as much as 120 fathoms. Most of the mines are worked by natives, the only important one controlled by Europeans being the Medapola. At the Medapola mine all the curing, grading, packing, and barreling are done at the mine but the product of the native mines is shipped to Colombo, where it is mixed with lead to bring it up to a certain standard.

### *Simple Mechanisms*

At the majority of the mines the only machinery used is the "dabare." This consists of a long wooden barrel with handles at each end. Round this a rope is given two or three turns and a bucket fastened to each end. It is worked by seven or eight men turning the handle. In a few places pumps are used for raising water, and two or three mines have engines for raising dirt, etc. Occasionally small fans are used for ventilating purposes.

The mines generally consist of a vertical shaft 8 or 9 fathoms deep or more sunk to cut the vein. The workings then go off on the underlay, the vein being opened out its entire length and taken down in one stage. Platforms are fixed at every 10 or 12 fathoms, on which "dabares" are placed for hauling. Means of ascent and descent are made by fixing poles across the vein and forming ladders. Excavating is done by blasting, generally with dynamite.

The vertical shaft is generally sunk through soft ground and requires timber. The timber consists of horizontal planks around the pit, held in place by vertical pieces, which are again held by "mukku" or poles across the ends and middle of pit, these latter being let into the vertical pieces. The whole is made tight by packing pieces and wedges behind the planks.

In the underlay or workings proper, which are generally in rock, no timber is required, but when necessary the supports consist of props fixed into the two walls at the proper angle. Where tunnels require timber, two props are set on the floor, a bar is placed on the top, and planks on these. Props and bars are set at intervals of a few feet, and planks run from one set to another.

### *Separation and Curing—Government Tax.*

In mining plumbago, it is merely raised from the ground and part of the rock separated. It is then carried in bags by coolies or bulls to a forwarding shed, where it is packed into barrels and forwarded to Colombo or elsewhere to be cured, that is, separated from stones, mica, or other associates by hand, and classified. The chief qualities are "lumps," "chips," "dust," and "flying dust." These are classified again according to quality.

Plumbago is a considerable source of revenue to the Ceylon Government, as there is an export royalty on it of 0.25 rupee per hundredweight (about 8½ cents per 112 pounds). For the benefit of the industry the Government arranges for the inspection of every working plumbago mine once in six months. The miners are advised generally as to their operations, and no mine is allowed to be worked which is considered unsafe. Information is afforded as to the mineralogy of plumbago districts. Skilled plumbago miners work for about 25 cents per day, American money, laborers for about 17 cents a day, and cleaners for about 6 cents per day.

*Trade Review by Chamber of Commerce*

The report of the Ceylon Chamber of Commerce for 1912, commenting on the trade in plumbago, states:

The falling off in exports chronicled last year has happily been more than adjusted during 1912, the totals for the last three years being as follows: 1910, 630,569 hundredweights; 1911, 539,844 hundredweights; 1912, 651,261 hundredweights.

In 1910 the United Kingdom took some 23,000 hundredweights less than in the previous year, an exceptionally heavy shortage, of course; but during the three years named above exports have been fairly constant to the United Kingdom and all consuming countries other than the United States and Germany, to which latter the material variations during the time have been confined.

It is interesting to notice that the United States, though always by far our largest customer, took in the year 1911 about 113,000 hundredweights less than the year before and 94,000 hundredweights less than the year after; while Germany took in the same year about 20,000 hundredweights more than in 1910 and 8,000 hundredweights less than in 1912, thus reflecting pretty accurately the state of the steel trade during the period in question.

The distribution of the years 1912 and 1911 is shown in the following figures:

| Destination | 1912 | 1911 |
|---|---|---|
| | *Cwt.* | *Cwt.* |
| United Kingdom | 106,964 | 103,461 |
| United States | 309,196 | 215,394 |
| Germany | 161,138 | 153,080 |
| Belgium | 57,474 | 55,505 |
| Other countries | 16,489 | 12,404 |
| Total | 651,261 | 539,844 |

After the comparatively good prices of the earlier part of 1910, and owing no doubt to the greatly restricted demand from the United States in the following year, a great many pits in the island stopped work. Supplies have consequently gradually become scarce and still remain so, thereby accounting for generally higher present values than the state of trade would otherwise appear to warrant.

The year closes with a rather weak demand, which may be expected to improve when the international situation becomes more settled.

## Another Tilting Crucible Furnace.

A new form of tilting crucible furnace for use with oil has been patented by W. W. Case Jr., of Denver, Col. The general design of the furnace is herewith shown. The tilting portion of the furnace is not claimed. What is claimed for the furnace is described by the author as follows:

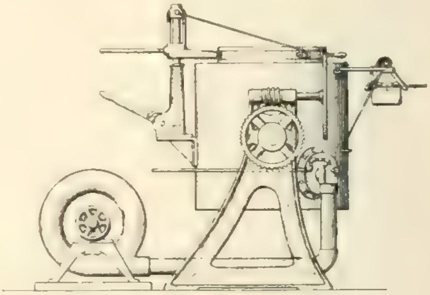


Fig. 1. Upright View of Furnace.

"It will be understood that I do not claim the broad idea of a tilting furnace, provided with a swiveled cover, and an oil fuel burner; but I do claim that my form of furnace as a complete unit, has in competition proved to be of greatly increased efficiency over furnaces of this type heretofore employed. For instance, in using oil as a fuel, it has heretofore been necessary, for the successful operation of a furnace, to have an air compressor, a positive blower, or steam for the burner, and burners using air under high pressure utilize

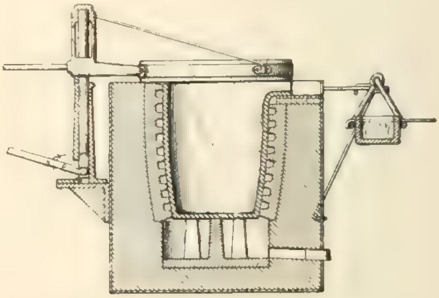


Fig. 2. Cross-Section of Furnace.

secondary air from the atmosphere, and as the combination of air and oil cannot under this condition be easily controlled, perfect combustion is seldom secured. Also besides being expensive, the use of air under high pressure in burners for melting furnaces causes a roar that is exceedingly annoying to the operatives, but with my furnace the face of the burner almost touches the boss of the inlet opening to the flame chamber and no secondary air is sucked in with great force, the air employed being delivered through the burner at a very low pressure from the low pressure fan, thus eliminating the roaring noise to such an extent, that operatives can converse beside a running furnace without raising their voices.

Besides by employing a low air pressure with the burner a very low blast flame is produced, and delivering same tangentially to the furnace below the crucible, it does not wear out the crucible so quickly as flames from a high pressure burner. Again, while no special claim is made in this application, to the broad combination of a crucible mounted in a furnace lined with a checker work of heaters, it will be seen that the complete arrangement and combination of the several particular elements is of great importance, not only in heating up the crucible quickly and after the fashion of a clean coke fire by the lining of checker-work heaters, but also will prevent over-charging and 'slopping over' of the furnace, so disastrous to furnace linings."

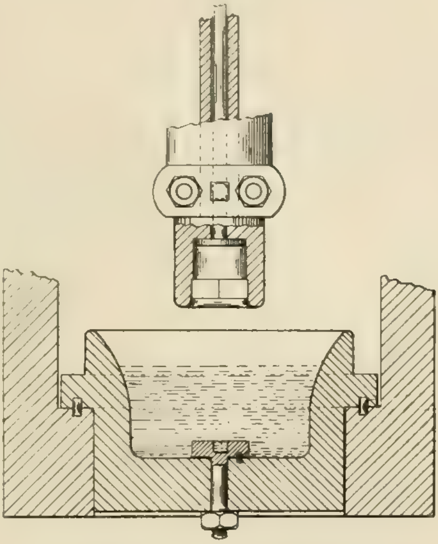
## Properties of Metalic Beryllium.

Two German investigators recently made some experiments on the reduction of metallic beryllium. The metal was obtained by the electrolysis of a fused mixture of the pure fluorides of beryllium and sodium. The product was purified from adherent oxides by centrifuging the fine powder in a mixture of ethylene bromide and alcohol. It was then compressed into cylinders and fused.

The metal, after melting, had a specific gravity of 1.842 and melts at 1280° C and does not volatilize at 1900° C. It does not tarnish readily and the authors say that its apparent inertness is, like that of aluminum, due to a film of oxide. It will be noticed that beryllium is much lighter than aluminum.

## A Method of Shaping Hollow Metal Articles by Means of Water.

A method of shaping hollow metal articles by means of water has recently been patented by John F. Lewis of Philadelphia, Pa., and is novel in its principle and method of working. The method of using the water in forming the articles may be understood from the sketch herewith shown, and which indicates the formation of a grease cup.



Use of Water in Die Forming Sheet Metal.

The die is used in the position ordinarily employed for the punch in making sheet metal goods. The punch is likewise located in a position usually occupied by the die and is immersed in water as shown. The punch, holding the die, is plunged down through the water and the punch proper forces the water into the interior of the hollow article, expanding it and forcing the sheet metal against the sides of the die. The hollow article may thus be forced to any desired shape. In this case, however, the article is supposed to have been first made by drawing the brass sheet in the regular way.

Zinc is now used for a far greater variety of articles than the majority of people believe. Large quantities of sheet zinc, nickel, copper or brass plated before manufacturing into various goods, are now consumed and has the appearance of nickel plated brass or steel.

## An Appliance for Electrogalvanizing Wire and Strip Sheet Metal.

The electroplating of wire is not as simple an operation as it may seem and the difficulty experienced has been the placing of the anodes so that an even coating of metal can be obtained. In a patent recently issued to Ferrerico Werth of Milan, Italy, an arrangement has been described for electroplating wire and strip sheet metal. The essential features of the apparatus employed is in the anodes and method of placing them.

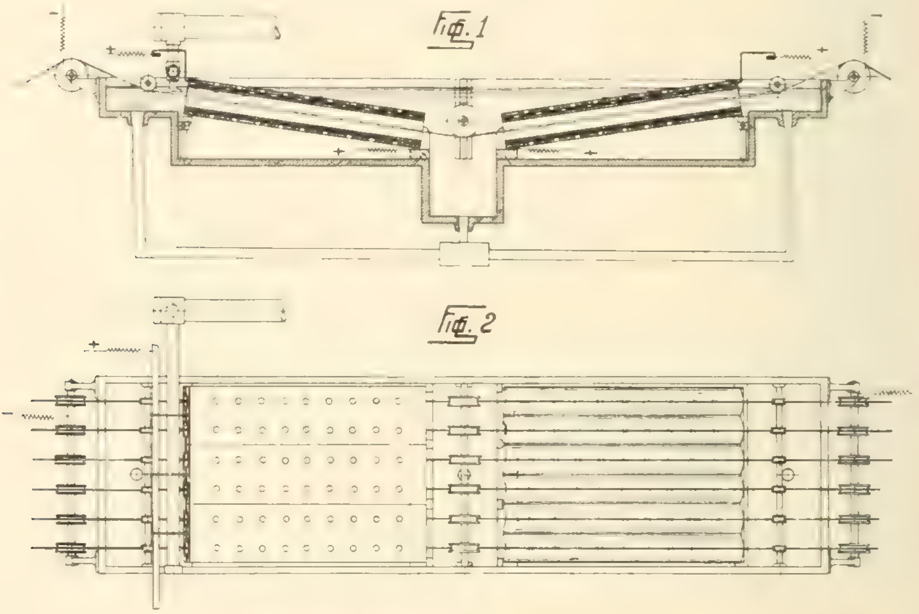


Fig. 1

Fig. 2

Apparatus for Electrogalvanizing Wire or Strip.

The manner of placing the anodes may be understood by reference to the sketch herewith shown. Corrugated, tubular anodes, formed of sheet metal of the kind deposited, are placed around the wires as shown in Fig. 1. If electrogalvanizing is to be done, the anodes are of zinc sheet formed into a tube. If strip metal is to be treated, then the tubes are rectangular or square, according to the section of the sheet. Around the outside of the anodes is wrapped a porous material, such as asbestos which will become saturated with the solution itself. The anodes are provided with holes to allow free circulation of the solution. It is claimed that by the use of this tubular anodes made in the manner indicated, that an even coating of metal is obtained upon the wire or sheet.

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Sheet brass is never free from impurities and always contains small amounts of lead and iron. These impurities come from the zinc used and it has been found impossible, from a commercial standpoint, to produce this metal without them. In the best grades, however, they are quite small. Commercial copper is quite pure and surpasses in purity that of the best grades of zinc.

The largest use for tin is in the manufacture of tin-plate. This consists of iron or steel sheet coated with tin by dipping into the molten metal. The largest use for tin-plate is in the manufacture of tin cans for containing food.

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An Austrian inventor, F. Hatlanek of Kladno, has recently patented a steel containing copper and nickel and which he claims is much more non-corrosive than ordinary steel. It is used for gun barrels. It is claimed that powder has less action upon it than ordinary steel barrels.

## The Outlook for Cobalt in Steel.

The metal cobalt is causing considerable interest at the present time for the reason that the supply is greater than the demand and new uses are being sought for it. An outlook is in the manufacture of the so-called "cobalt steel." The following article from *The Ironmonger* will indicate the present condition of the subject:

During the past few months many rumours and statements have been published concerning a new high-speed tool-steel made by the Becker Steelworks, of Willich, in Germany, the most recent of these references appearing in *The Ironmonger* of May 24, p. 63. This steel is said not only to have a much greater efficiency and longer life than all the high-speed tool-steels which have been used hitherto, but also to cost no more. Considerable scepticism was aroused at first owing to the fact that the new material was called iridium steel, but it now appears that it is more correctly termed cobalt steel. According to the patent specification, the proportion of cobalt used in the Becker steel is much greater than that of added metal in other special steels, and may amount to 15 per cent. Comparative tests reported to have been made by Professor G. Schlesinger, of the Technical High School at Charlottenburg, are said to indicate that the new cobalt steel is superior to more than thirty-three types of British, Austrian, and German tool-steel with which the trials were made. Tools of uniform size of the different steels tested were made to cut in a lathe hard chrome-nickel steel, ordinary open-hearth steel, and cast iron, with respective tensile strengths of 65, 31, and 10 tons per square inch. In most cases the mean of three results was taken for each kind of tool. The results showed that in all cases the average in cutting time of the cobalt steels exceeded those of the other steels two, three, or more times, according to the nature of the test. The Becker works, a business of comparatively recent foundation, are advertising the result of Professor Schlesinger's experiments in the leading papers of Germany, the professor having committed himself to the rather sweeping statement that the cobalt steel known as "Becker-Iridium" is far superior to any other steel of German or foreign manufacture, and, further, that it is the cheapest high-speed steel in the world. This announcement has provoked a reply, also in the form of an advertisement, signed by eighteen of the leading steelworks in Germany, in which they declare that no samples have been submitted by them to Professor Schlesinger for his comparative tests, that they have not even been asked for them, and that if their products have been tested it had been done without their knowledge and consent. They also state that Professor Schlesinger has not obtained the samples which he says he has tested from their works direct, but has left it to the Becker Steelworks, his own clients, to procure them. The eighteen works further point out that they have not communicated their selling prices, which should form the basis of the ascertainment of comparative values, so that these also must have been supplied to Professor Schlesinger by the Becker Works. In fact, they plainly suggest that the professor's statements should not be regarded as authoritative.

The Sheffield High-Speed Steelmakers' Association are endeavouring to get the British patent for this new steel revoked (although no opposition was originally made to its grant), on the grounds that the invention is not novel in this country and that high-speed steel containing cobalt has already been made in Sheffield. As a matter of fact, it would be surprising if some experiments had not previously been made with cobalt, seeing that many such rarer metals have been tried for high-speed steels, but whether such experiments were of sufficient commercial importance or gave sufficiently successful results to constitute a genuine anticipation of the German invention remains to be seen. If the practice of high-speed steel making in England previous to the German invention included a knowledge of cobalt steel as a commercial article, it is somewhat surprising that the results of the tests now made at Charlottenburg should be regarded as remarkable. An unsuccessful experiment is no anticipation of a successful invention, and we hope that the Sheffield Steelmakers will be able to prove their claims, and so prevent a Continental monopoly. Of the world's output of high-speed, tool-steel, which is roughly valued at $18,750,000 yearly, about two-fifths is made in England, while Germany, Austria and America each contribute one-fifth.

# Questions and Answers.

QUESTION No. 1330. We have some small pieces of tubing to nickel plate. They are quite small, about 1 inch in length and about [illegible] in. in diameter with a thin wall. What is the best method of plating them?

*Answer.* You will find it costly to "string" on wires to plate them, but if you have a small quantity you can plate them in this manner. If a larger quantity are had, then a basket will have to be used, but if you are going to nickel plate a large quantity, then a plating barrel will be found the most economical. You can plate the tubes very satisfactorily in a plating barrel, of which there are a number of excellent kinds on the market. It is the cheapest method for plating known and as good a deposit as by any other method can be obtained.

QUESTION No. 1334. Is there any substitute for tin in bronze or composition? Owing to the high price of this metal at the present time, the use of it in bronze or composition brings up the cost.

*Answer.* No substitute for tin in bronze or composition has yet been found and it is impossible to make these mixtures without it. You will be obliged to stand the high price.

QUESTION No. 1335. Kindly inform us if alcohol and soft rouge used for buffing silver plated coffin hardware will tarnish it?

*Answer.* There is nothing in the rouge or alcohol which will tarnish the silver. The most frequent source of the tarnishing of such hardware is the tissue paper in which it is wrapped. The pasteboard of the boxes will also tarnish it if it contains substances which act on the silver. The tissue paper, however, is the common source. As coffin hardware is not lacquered, it is very easily tarnished. Special tissue paper is now made for this purpose and which will not tarnish the silver. Tarnishing occurs more frequently during the hot and damp summer months.

QUESTION No. 1336. We would appreciate a good aluminum mixture for use in making match plates. It must have very little shrinkage and finish up nicely. The castings must be sound. These plates are about one-quarter of an inch in thickness.

*Answer.* You cannot obtain an aluminum mixture which will not shrink and you will have to make allowance for it. The shrinkage will be about three-sixteenths of an inch per foot. For the best castings the aluminum and copper alloy cannot be equalled. This consists of the following:

| | |
|---|---|
| Aluminum .... ............ | 92 lbs. |
| Copper .......... ........ | 8 lbs. |

but it does not finish as well as the mixtures containing zinc. The following is an excellent mixture and finishes well:

| | |
|---|---|
| Aluminum .................. | 82 lbs. |
| Zinc ....................... | 15 lbs. |
| Copper .................. . | 3 lbs. |

This mixture, however, is more apt to crack in cooling, but if the match plate is free to shrink, as it usually is, you will probably find it satisfactory. The cracking in the mold while cooling is the only objection to its use.

QUESTION No. 1337. We are experiencing considerable difficulty with our tinning. The articles we are tinning are of sheet steel about 5 inches in diameter. You will notice black spots on the inside of the samples we have sent you. We first clean the work with gasoline and then put them through a caustic soda solution, then through a hot sulphuric acid pickle, and then into the flux consisting of zinc dissolved in muriatic acid (which we make ourselves). The black spots are what are bothering us. The tinning is good otherwise.

*Answer.* The difficulty is caused by the tin not covering the spots and which are, in reality, the bare steel. Either there are spots of rust on the steel before tinning, or the flux does not cover them on account of grease on such particular spots. We think if you are careful to see if the surface is covered with flux and is free from rust you will have no further difficulty as the tinning on the other portions of the sheet steel is good.

QUESTION No. 1338. We have sent you a portion of a steel hame that has been nickel plated and it is claimed to be done in such a manner that it is "rust-proof." Will you kindly examine the piece and advise us, if you can, what the method is for rendering it proof against rust?

*Answer.* The steel hame is treated in the following manner: The steel is cleaned in the usual way and then given a light copper deposit in a cyanide copper solution, preferably used hot. It is then given a heavy copper deposit in an acid copper solution. It is this heavy copper deposit that renders the article rust proof and it can only be produced in an acid copper solution. The copper deposit from a cyanide copper solution is light and it would take a very long time to obtain the same thickness as that given by the acid solution. After the heavy copper deposit is obtained, the surface is cut down, if necessary, with tripoli and then nickel plated in the usual manner. The acid copper being soft will not peel, and its thickness will protect the steel from rusting.

QUESTION No. 1339. How would you recommend to melt scrap aluminum sheet so that it will not waste excessively?

*Answer.* The best way to melt aluminum scrap, such as sheet or chips, is to have a pot of molten aluminum at a low red heat and then add the scrap to it, pushing it down at once under the sufrace so that it is not exposed to the air at all. In this manner there is no oxidation of the aluminum and it can be melted with the minimum waste. The scrap will dissolve in the molten aluminum and this is an ideal condition.

QUESTION NO. 1340. We want a nickel deposit that will resemble a dark steel. The reason this is wanted is to protect the steel goods, and still have the appearance of steel. We have been informed that this can be done.

*Answer.* You can use a so-called black nickel, but without the full amount of the ingredients for producing the full black color. Use the following:

| | |
|---|---|
| Water | 1 gallon |
| Double Nickel Salts | 8 oz. |
| Ammonium Sulphocyanate | 2 oz. |

This will give you a steel colored deposit of nickel, but if not dark enough you can add a little sulphate of zinc to the solution and a still darker shade will be produced. The maximum amount of sulphate of zinc that can be added is 2 oz. per gallon of solution, but this will give you a black color. We advocate using about ¼ oz. per gallon if the color you first obtain is not sufficiently dark.

QUESTION NO. 1341. We have a letter from a concern in India in reference to what they term tin molding. They have large stocks of what they call waste tin and wish to mold into thick or thin sheets and then roll with a gloss. They want to know what kind of furnace is suitable for this purpose.

*Answer.* We are afraid your correspondent has an erroneous idea about the tin. Undoubtedly he refers to tin plate scrap and this cannot be melted or treated for re-rolling. There is only two things that can be done with it. The tin can be reclaimed from it by the "detinning" process, or the whole can be melted and made into sash-weights.

QUESTION NO. 1342. Can you give us a method of "drawing off" nickel from nickel plated brass. What we want is to take the nickel from our brass racks used in nickel plating.

*Answer.* We know of no method for "drawing off" nickel from brass, as you call it. It can be stripped by means of a solution but we doubt whether you will find it to pay in the case of the racks on account of using so much acid. The acid strip used for it is as follows:

| | |
|---|---|
| Sulphuric Acid | 3 gallons |
| Nitric Acid | 2 gallons |

The article to be stripped must be dry and left in the stripping solution until the nickel is removed. The brass will be attacked but very slightly. A little water in the strip will make it work more rapidly, but the brass is then attacked to some extent. Some manufacturers prefer to sell the racks. Others pound the nickel off.

QUESTION NO. 1343. Can you give me the amount of copper annually consumed in the manufacture of pure copper castings in the United States?

*Answer.* This is an unusual request and we have never seen any statistics on the subject. The General Electric Co. of Schenectady and the Westinghouse Company of Pittsburgh, Pa. are the two large makers of copper castings. The amount produced by other manufacturers is comparatively small, when these two companies are taken into consideration. There is practically no use for pure copper castings except in the manufacture of electrical apparatus.

QUESTION NO. 1344. Our goods are nickel plated plumbers' brass work. We are troubled by spotted places on the casting and which have the appearance of emery in the metal. We have sent you a basin trap casting that has been nickel plated and which shows the trouble. Can you inform us what the cause of the spots are?

*Answer.* The appearance of the casting that you have sent indicates that it is not in the nickel plating but in the casting itself. The casting has small spots of dross in the surface and which, of course, will not polish out. The nickel will not deposit so that the holes will be covered and when this deposit is buffed, the imperfections become filled with buffing dirt, producing the appearance you mention. You are making your castings of yellow brass and this, of course, does not cast clean. Whether you are using aluminum in it we cannot say, but if you are then this will produce even dirtier castings. You should investigate this point and see if you cannot gate or pour the castings so that they are not as dirty as the one you sent us.

QUESTION NO. 1345. I have recently had an occasion to electrogalvanize some sheet steel work with some depressed portions in them, but I cannot make the zinc deposit in the bottom of these portions. The ordinary solution that I have been using works all right and the zinc deposits evenly. What is the trouble?

*Answer.* Your solution is probably too weak. Use about 4 lbs. of (crystallized) sulphate of zinc to a gallon and about 2 oz. of sal-ammoniac in each gallon. The solution will then "throw" better and deposit in the deep portions.

QUESTION NO. 1347. What is the material used for making the white enamel letters used for signs?

*Answer.* The letters are made of steel sheet, cut in the form desired and then coated with the enamel mixture and the whole heated to fuse the enamel itself. This enamel is composed of the following:

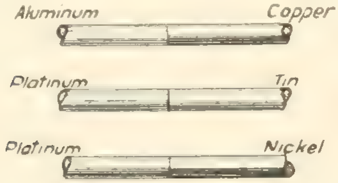
| | |
|---|---|
| Borax | 25 parts |
| Feldspar | 45 parts |
| Cryolite | 1 part |
| Soda-Ash | 3 parts |
| Saltpeter | 2 parts |
| White Clay | 8 parts |
| Tin Oxide | 5 parts |

QUESTION NO. 1348. We are using bi-sulphite of soda in our brass solution. Some one has informed us that sulphuric acid will do as well. Is this correct?

*Answer.* Sulphuric acid will *not* answer the purpose and will ruin the solution. Someone ill advised you.

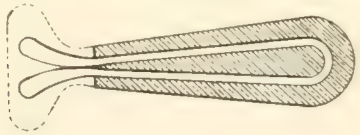
# Patent Abstracts.

1,066,468, July 8, 1913. PROCESS AND APPARATUS FOR ELECTRIC WELDING. Lewis W. Chubb of Edgewood Park, Pa. Assignor to the Westinghouse Electric & Mfg. Co., of Pittsburgh, Pa. A method of electric welding two similar or dissimilar metals. Two metals of widely different melting points, such as tin and platinum may also be welded. The method used is to concentrate the heat at the point of contact for an inappreciable length of time. This is accomplished by means of a condenser.



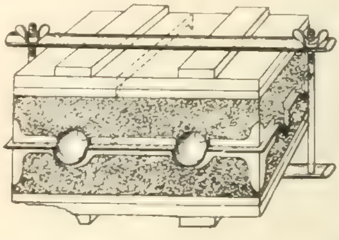
1,065,855, June 24, 1913. PROCESS OF MANUFACTURING ALLOYS. Ludwig Weiss of Berlin-Charlottenburg, Germany. A process of making alloys by mixing fine divided metal with the oxide of another metal, briquetting the whole with water glass and carbon and then smelting.

1,067,231, July 15, 1913. MANUFACTURE OF INSULATED HANDLES FOR VESSELS AND UTENSILS. Friederich August Antoni of Cologne-Ehrenfeld, Germany. A rod is covered with a mixture of asbestos and lacquer and which is then baked. The rod is then applied to the utensil by means of a second metal piece as shown in the illustration.



1,066,154, July 1, 1913. METHOD FOR INSERTING WORK PIECES. Charles Sandoz-Moritz of Tavannes, Switzerland. The invention relates to a method for inserting small metal goods, such as pins, studs, rivets etc., into perforated plates for further assembling or insertion into manufactured goods. The process is applied more particularly to the manufacture of lanterns. The machine is so constructed that air pressure is used for assembling the pieces and at the same time a reciprocating motion.

1,065,921, July 1, 1913. SNAP FLASK. Harold Cabley of Walsall, England. Assignor to Matthew Harvey & Co., Ltd. of the same place. A method of making a small flask for use more particularly in molding brass or bronze castings. The ordinary snap flask will not permit of being poured "on end" as the two parts will slip past one another. In this invention the flask is made so that it can be poured "on end" or at the side when mounted vertically for pouring.

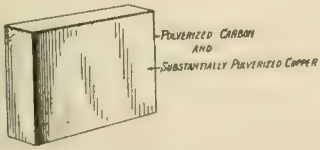


1,066,787, July 8, 1913. PROCESS OF PRODUCING ZINC FROM BLUE POWDER. Warren F. Bleecker of Canonsburg, Pa. Blue powder, which is a by-product in the smelting of zinc, consists of metallic zinc particles, each of which is surrounded by a very thin coating of oxide or other substance. The process consists in placing the blue powder in a bath of sodium zincate or sodium fluoride and subjecting it to electrolysis. It is stated by the inventor that 5 per cent of blue powder is produced when zinc is smelted and that this must be remelted in the ordinary way to obtain the zinc.

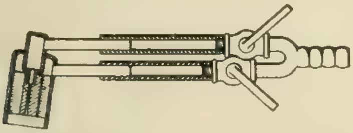
1,067,785, July 15, 1913. NON-INFLAMMABLE CELLULOSE COMPOUND AND METHOD OF MAKING SAME. William Godson Lindsay of New York City. Assignor to the Celluloid Company of Newark, N. J. The non-inflammable cellulose consists of an acetyl cellulose soluble in acetone, and triphenylphosphate and urea, together with acetylene tetrachloride.

1,065,379, June 24, 1913. TREATMENT OF STEEL, IRON ETC. Adolph W. Machlet of Elizabeth, N. J. A method of case hardening and finishing iron and steel articles. The method consists in heating the iron or steel in an atmosphere of ammonia. The iron or steel used is soft and is heated to a red heat for about 2 hours and allowed to cool while the ammonia gas is passing.

1,067,003, July 8, 1913. PROCESS OF MAKING ELECTRICAL CONDUCTORS. William Deats and Campbell Scott of Yonkers, N. Y. Assignor to the National Carbon Co. of Cleveland, Ohio. A method of making a block of carbon and metal intimately mixed. Either copper or brass is used for the metal. The object of the mass so made is either for electrical conductors, motor brushes or bearing surface where the pressure is not too great. The carbon and metal, both in the form of powder, are mixed and subjected to high pressure. The mass so obtained is then baked.



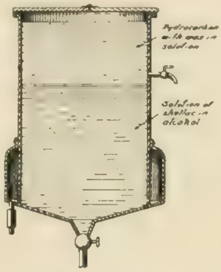
1,066,915, July 8, 1913. BRAZING BURNERS. William Wallace Kemp and William H. Van Horn of Baltimore, Md. A brazing burner and more particularly the tip. The device is so constructed that there is no danger of back fire or rapid burning out of the nozzle or tip by the intense heat of the flame. The burner is so constructed that the flame may be adjusted for varying sizes.



1,067,698, July 15, 1913, METHOD OF ELECTROLYTICALLY RECOVERING NICKEL. Horace L. Wells of New Haven, Conn., and Tom Cobb King of East Orange, N. J. A method of extracting nickel (and cobalt) from matte consisting largely of nickel and copper sulphides. The matte is treated with hydrochloric acid, the solution electrolyzed and the metals deposited. The chlorine liberated is combined with hydrogen sulphide to form hydrochloric acid again.

1,067,993, July 22, 1913. SOLDERING BLOCK HOLDER. Theodore G. Lewis of Buffalo, N. Y. Assignor to the Buffalo Dental Mfg. Co., of the same city. A device for holding an asbestos or carbon block used for soldering small articles like jewelry. The novelty lies in the manner of holding the block and not on the block itself, which is of the ordinary round pattern.

1,066,794, July 8, 1913. PROCESS OF REFINING SHELLAC AND ITS ALLIED LACS. Howard Cassard of Baltimore, Md. The process consists in the use of two solvents for purifying the shellac. The first solvent used is kerosene which dissolves out the wax that is present in the shellac, after which the shellac itself is dissolved out by alcohol. The alcohol is then distilled off leaving pure flake shellac.


Hydrocarbon with wax in solution
Solution of shellac in alcohol

1,065,401, June 24, 1913. PROCESS OF REMOVING ENAMEL FROM ENAMELED GOODS. Gustav Spitz of Brünn, Austria-Hungary. Assignor to the Goldschmidt Detinning Co. of New York City. The ordinary process of removing enamel from imperfect enameled cooking utensils consists in immersing them in melted caustic soda which dissolves off the enamel, leaving the tin or steel surface underneath. According to the present patent, the enameled article is covered with a paste composed of caustic soda and carbonate of soda and then heated. The enamel is attacked so that it becomes soluble. The article is then treated with hot water which dissolves the mass thus formed, leaving the bare iron or steel.

1,066,825, July 8, 1913. MOLDING MACHINE. Wilfred Lewis of Philadelphia, Pa. Assignor to the Tabor Mfg. Co. of the same place. The invention relates to jarring molding machines and the novelty consists in the method of minimizing the shock on the foundation which occurs when the concussion on the anvil takes place.

1,066,298, July 1, 1913. PICKLING AND WASHING MACHINE FOR METAL PLATES. Adolf Meyn of Pittsburgh, Pa. A pickling and washing machine for metal plates, such as those to be tinned or galvanized. The machine is for lifting them in and out of the pickling and washing tanks and agitating them while they are in them.

# Trade Items.

The Inter[illegible] [illegible] Co., Ltd. has been incorporated in Montreal, Canada, with a capital stock of $50,000 for the manufacture of valves.

The Union Light Company, 1465 Main St., Bridgeport, Conn., dealers in gas lighting fixtures, have started a polishing and buffing department for re-finishing gas fixtures.

The brass foundry of the Delco Engineering Co. of Dayton, Ohio, manufacturers of automobile devices is in charge of John A. Logan, formerly foreman of the brass foundry of the National Cash Register of that city.

F. L. Lake, consulting metallurgist and special correspondent, has moved his metallurgical engineering business from Bayonne, N. J., to Detroit, Mich., and is located at 1453 Waterloo St.

The Metal Specialty Company has been formed in Newark, N. J., for the manufacture of silver plated novelties. Mesh bags will be manufactured for the present. The company is composed of S. Trepp and J. Holder. The factory is located at 97 Chestnut St.

The Riverside Pattern & Foundry Co., 207 Knowlton St., Bridgeport, Conn., brass founders and manufacturers of metal and wood patterns, are contemplating the installation of a gray iron foundry in connection with the brass foundry business. William D. Dorus has purchased an interest in the company.

Mappin & Webb, of London, England, one of the largest manufacturers of silver plated ware in England, are to start a factory in Canada. A company called Mappin & Webb, Ltd., has been incorporated in Montreal with a capital stock of $500,000 for this purpose. It is stated that a brass foundry will also be a part of the factory. J. S. Johnston, A. C. Johnston and Clarence Moore are the incorporators.

Dr. Carl Hering of Philadelphia, Pa., the well known electrical expert, has returned from his European trip where he delivered a lecture before the Faraday Society of London, England on the "Pinch Phenomenon" as applied to the electric furnace. Dr. Hering in connection with G. H. Clamer of the Ajax Metal Company of Philadelhpia recently brought out a new type of electric furnace for melting metals in which this "pinch" effect is utilized.

William T. Finkell, formerly of the Finkell-Hachmeister Chemical Company of Pittsburgh, Pa., and who recently severed his connection with this company, has opened an office at 100 William St., New York City and will handle heavy chemicals for the manufacturing trade. A specialty will be made of electroplaters' and polishers' chemicals and supplies. Mr. Finkell has been connected with the heavy chemical business for the past 22 years which will indicate his familiarity with the business.

A plating department is to be started at Pearl Harbor, Hawaii, by the United States Navy Department at the Naval Station.

The R. E. Dietz Company of Syracuse, N. Y., manufacturers of lanterns and automobile lamps, have purchased a site for a new factory which will cost $70,000.

The capital stock of the Hayes Pump & Planter Company of Galva, Ill., has been increased from $200,000 to $750,000. The capacity of the plant will be increased. A brass foundry is operated.

The Bronze Metal Co., of Meadville, Pa., expect to set up their new plant within a short time. They are now located in the old Erie R. R. shops. Brass and bronze castings are made.

After a number of years of research in their laboratories for experimental reasearch, the General Electric Company of Schenectady, N. Y., have produced a new tungsten lamp that has twice the efficiency as the ordinary tungsten lamp. The filament is of special shape and the bulb is filled with nitrogen.

The new factory of the Noble & Westbrook Mfg. Co., Hartford, Conn., is practically completed. It is located on Westbrook St. Marking devices, stamps and metal checks are manufactured and the company owns the right to manufacture the Dwight Slate marking machines, formerly made by the Dwight Slate Machine Co. of Hartford.

The Chili Copper Co., of Chili, South America, which the Guggenheim interests are now exploiting, has awarded the contract for the new electrical equipment for the mines to Siemens and Schuckert of Germany. It is stated that that contract was awarded after close competition with the General Electric and Westinghouse companies. The contract is for $2,856,000.

The J. W. Paxson Company of Philadelphia, Pa., manufacturers of foundry supplies and equipment, are sending out to the trade their new Bulletin No. 30 on wire and bristle brushes. These are of large variety and comprise brushes for foundry and polishing use. This catalogue is the most complete on brushes for the foundry trade that has yet been published. All the goods described in the catalogue are made in their own factory.

The American Brass Company of Waterbury, Conn., has purchased a strip of land on the Housatonic River in Stratford, Conn., near its outlet into Long Island Sound and, it is stated, a coaling station will be located on the property. Water facilities will be had and from which the coal can be transported into the various plants in the Naugatuck Valley by rail. This will give them ample storage facilities for the large quantity of coal consumed by the various individual plants of the company.

The Br[illegible] Stove [illegible] of Regina, Sask., Canada, are to erect a factory for the manufacture of stoves. It is reported that the factory will cost $100,000.

A new factory is contemplated by the Stowell Screw Co. Ltd., of Montreal, Canada, manufacturers of wood screws, machine screws and wire goods.

Chas. Nobs & Son, 24 Boudinot St., Newark, N. J., manufacturers of watch case materials, have moved to 156 Astor St., and are putting in new machinery.

The W. D. Smith Silver Co., has been incorporated in Wilmington, Del., with a capital stock of $250,000. The incorporators are Charles B. Bishop, Clarence J. Jacobs and Harry W. Davis.

The O. C. White Company of Worcester, Mass., manufacturers of lighting fixtures, are to increase their manufacturing facilities by taking additional space in the building which they now occupy on Hermon St.

The Neptune Meter Company of Long Island City, N. Y., manufacturers of water meters are to erect a new brass and iron foundry which will be 100 x 200 feet. A new machine shop, 75 x 175 feet, will also be built.

The Pottsville Foundry & Stove Co., has been organtzed in Pottsville, Pa., for the manufacture of stoves and ranges. The old Derr Foundry in that city will be occupied. S. F. Laucks of the York Safe & Lock Co., of York, Pa., is the president.

The Corundum Products Company of Spokane, Washington, are producing what they call a "Silcor Tumble" and for use in polishing metals by tumbling. They state that it beats balls, buffing or sand blast and produces the highest lustre. They solicit an opportunity to explain the matter and to send sample.

The Bristol Company of Waterbury, Conn., manufacturers of the "Bristol" recording instruments and pyrometers, are sending out to the trade preliminary bulletins Nos. 175-176 and 178. Bulletin No. 175 describes their new electrical resistance thermometers, recently placed on the market. No. 176 is a description of their electric pyrometers and No. 178 describes the "Bristol" wet and dry bulb recording thermometers.

The Titan Copper Products Company, which was recently organized in Buffalo, N. Y., will operate a plant for the manufacture of brass, bronze and aluminum castings. The president of the company is Charles V. Slocum who was formerly connected with the Titanium Alloys Co. of Niagara Falls, N. Y. It is stated that applications for patents have been made for the processes to be used. The superintendent of the company will be Frank P. Lund of Buffalo, N. Y., well known in the brass foundry trade. The vice-president is A. N. S[illegible] and W. W. Slocum is the treasurer.

The capital stock of the General Aluminum & Brass Castings Co., of Detroit, Mich., has been increased from $75,000 to $150,000.

The name of the Kinkel Mfg. Co., of Milwaukee, Wis., has been changed to the Adjustable Fixture Company. The manufacture of gas and electric fixtures is carried on.

The plant of the American Clock Co., of Brooklyn, N. Y., has been sold on account of a chattel mortgage. It is reported that over 3,000 clocks were sold.

Land adjoining the plant of the Reading Optical Co., of Reading, Pa., has been obtained by this company and an addition to the plant 16 x 70 feet will be made.

The Sterling Mfg. Co., of Racine, Ill., manufacturers of steel specialties, and recently incorporated with capital stock of $10,000, are to erect a factory.

The Gruen Watchcase Company of Cincinnati, Ohio, manufacturers of watches and watch cases, have purchased a tract of land on McMillan St., in thit city and, it is stated, will erect a new factory on it.

A new factory for the manufacture of steel filing cabinets, shelving and other steel office equipment, is shortly to be erected by the Paltridge Metal Equipment Co., of Chicago, Ill. The office of the company is now at 729 Monadnock Building.

The C. & C. Electric & Mfg. Co., of Garwood, N. J., manufacturers of dynamos, motors and appliances have recently issued a new catalogue entitled "Electric Arc Welding Apparatus" in which is given a description of their new apparatus for electric arc welding. Those interested in electric welding will find it of much interest.

The erection of an extensive addition to the works of the Stewart-Warner Speedometer Co. of Beloit, Wis., will shortly be made. The factory will be 120 x 392 feet and of sawtooth construction. The company is the result of the merger of the Stewart & Clark Speedometer Co. of Chicago, Ill., and the Warner Instrument Co., of Beloit.

The Worcester Pressed Steel Co., of Worcester, Mass., manufacturers of pressed and drawn steel goods, are to erect a rolling mill for the manufacture of cold rolled steel. This department, however, will be conducted under the name of the Worcester Strip Mills and the business has been incorporated under this name. John W. Higgins is treasurer and general-manager and Arthur P. Higgins is secretary. The new mill will be 90 x 150 feet.

Circulars are being sent out by the Foundry and Machine Exhibition Company and the American Institute of Metals in regard to the Convention to be held in Chicago commencing October 10th. This will be held in the International Amphitheatre Building and will continue throughout the week. It is expected that this building will give the best satisfaction for the Convention yet obtained as the accommodations for both exhibits and visitors are superior to any had at previous ones.

The Pittsburgh Lamp & Glass Company of Pittsburgh, Pa., with works at Coriopolis, Pa., are placing on the market a new line of clocks, the case of which is glass.

The Corbin Screw Co., of Hartford, Conn., manufacturers of wood and machine screws, are to erect a seven story addition to their plant at High and Lafayette St. It will be 50 x 120 feet.

The assets of the Pawtucket Mesh Bag Company of Pawtucket, R. I., were sold at auction recently and netted $109. The liabilities were $2,395. The sale did not include the accounts of the company.

The C. I. Yale Mfg. Co., of Yalesville, Conn., manufacturers of hollow ware and plated household utensils, announces that they will not rebuild their plant recently destroyed by fire.

The W. S. Tyler Company of Cleveland, Ohio, manufacturers of wire cloth, grilles and elevator enclosures, are to erect a four story addition to their plant and which will be 55 x 144 feet.

The name of C. H. Penniman & Co., 354 Mulberry St., Newark, N. J., has been changed to the Parker Silver Co. H. A. Parker is the president of the company. The manufacture of sterling silver novelties is carried on.

The Allen Cut Glass Company of Johnstown, Pa., are to install a department for the manufacture of gold and silver mountings for cut glass. A new plant will also be erected on land opposite their present factory in which 500 hands will be employed. It is stated that some $250,000 worth of cut glass is to be turned per year.

The Standard Machinery Company, 7 Beverly St., Providence, R. I., manufacturers of rolling mills, jewelers' and metal working machinery, are sending out to the trade their new catalogue describing the various products which they manufacture. This is a work of 51 pages and in it the various metal working machines is described. The catalogue is profusely illustrated.

The B. F. Sturtevant Company of Hyde Park, Mass., manufacturers of fans, blowing and exhausting machines, and similar goods, announces that it will shortly establish a manufacturing plant in Canada. Arrangements have been completed for the acquiring of the plant of the Canadian Motors Company at Galt, Ont. All the Canadian work will be done there.

J. W. Conchar, 41 Park Row, New York City, has recently completed and placed on the market Vol. 2 of his "Scientific Price and Profit Department." The purpose of the book is to provide a rapid method for arriving at a profitable selling price, and to convert the business man to a belief that the true cost is not the price paid for an article. The price of the book is $2.00 and it will be found of value in all classes of manufacturing and mercantile business.

The Niagara Searchlight Co., of Niagara Falls, N. Y., are to erect a new, two-story factory building in that city.

The Ohio Galvanizing & Mfg. Co., of Niles, Ohio, will either move to Middletown, Ohio or start a branch plant in that place.

The Silverman Bros. Mfg. Co., of Providence, R. I., manufacturers of jewelry, are to erect a large factory building on Broad St.

The St. Louis Screw Co., East Clarence St., St. Louis, Mo., has acquired a large piece of property at Luther and Bulwer Aves., upon which an extensive factory will be built.

The firm of Morse & Andrews has been formed in Attleboro, Mass., and will manufacture plated jewelry. The factory will be located in the Makepeace Bldg.

It is stated that the American Cash Register Company of Columbus, Ohio, recently capitalized at $600,000, will erect a factory in Saginaw, Mich.

The Elliott & Douglass Mfg. Co., of Chartley, Mass., manufacturers of jewelry, have moved from that place to Union St., Attleboro, Mass., where they are located in the Tappan Building.

The Berbecker & Rowland Mfg. Co., of Waterville, Conn., manufacturers of cabinet hardware and similar goods, are to build a new brass foundry. It will be 43 x 220 feet and will contain eight furnaces.

The General Mfg. Co. 66 North Elm St., Waterbury, Conn., manufacturers of rivets and hardware, will shortly erect an addition to their plant. It will be of brick, 28 x 77 feet and two stories high.

Contract for the new plant of the J. W. Brown Mfg. Co., of Columbus, Ohio has been awarded. Automobile lamps are manufactured. The plant will be located on the land recently acquired and will be 100 x 400 feet, two stories high. The cost is stated to be $100,000.

The Kilbourn Mfg. Co., has been incorporated in New Milford, Conn., for the manufacture of brass goods and are already manufacturing. The capital stock is $100,000 and the incorporators are Howard E. Kilbourn, M. P. Kilbourn, and Charles A. Postley of New York City.

A large plant will be erected by the Medina Iron and Brass Co., of Medina, N. Y. The manufacture of plumbers' brass goods and plumbers' fittings is carried on. A tract of land four acres in extent has been obtained for this purpose. The buildings will be of fire-proof construction.

The E. I. Du Pont de Nemours Company of Wilmington, Del., have recently issued a very interesting book called the "History of the Du Pont de Nemours Powder Company." It is a history of this extensive company and is also a history of the manufacture of powder in the United States. The book is illustrated with many photographs and is a valuable contribution to the subject.

Harry Butter of East Cambridge, Mass., scrap metal refiner, is to build a new metal refining plant in Dorchester, Mass.

A site has been purchased by James Locke of Los Angeles, Cal., and a brass and aluminum foundry will be erected on it.

The Weller Meter Company has been incorporated in Elyria, Ohio, with a capital stock of $10,000, to manufacture water meters.

A plant for the manufacture of solder, babbitt, white-brass and type metals is to be erected by G. E. Jobborn of Hamilton, Canada. It will be located on Guise St.

It is reported that L. E. Frenot of Newark, N. J., formerly manager for the Joseph Reinbold Bronze Co., will shortly start a foundry for the manufacture of fine castings.

An addition to the plant of the Gould Storage Battery Company at Depew, N. Y., will shortly be made. It will be 75 x 225 feet and two stories high. The cost will be about $30,000.

A factory is to be erected by the Automatic Register Company of St. Louis, Mo., at a cost of $100,000. It will be used for the manufacture of their fare-box registers and will be located at 318 North Fourth St.

The aluminum foundry of the Aluminum Castings Company of Manitowoc, Wis., which has been closed since spring, is to be reopened. The foundry was closed on account of labor difficulties.

The Champion Spark Plug Co., of Toledo, Ohio is having plans prepared for the construction of a two story basement factory 60 x 121 feet. It will be used for the manufacture of spark plugs.

A factory will be erected by the Canadian Rogers Company of Toronto, Canada, manufacturers of silver plated ware. It will be 72 x 150 feet and three stories. The location will be on King St., West, and it will cost $50,000.

The Coates Clipper Co., of Worcester, Mass., manufacturers of flexible shafts and grinding and polishing devices, have issued a new catalogue of their products. This is an extensive catalogue of 63 pages, illustrated with cuts of all apparatus and uses of their flexible shafts in numerous lines of work.

The new Delaware Brass & Aluminum Company, recently organized in Muncie, Ind., for the manufacture of brass, bronze and aluminum castings has been started. J. Becket and Charles Becket, formerly of the Machinists Foundry of Muncie are the organizers.

The United Lead Company, 111 Broadway, New York City, are erecting a plant in Atlanta, Ga., and which will be called the Georgia Lead Company. A new building, 40 x 200 feet will be erected, and at a cost of about $25,000. It is also stated that about $25,000 will be spent in equipment. The manufacture of lead pipe, traps and sheet lead will be carried on

The Pollock Safety Clasp Co., of Attleboro, Mass., conducted is endeavoring to settle with their creditors

A new factory is to be erected by the General Fire Extinguisher Company of Montreal, Canada. It will be located at 175 McCord St.

The plating and polishing plant of the Mueller Mfg. Co., at Sarnia, Ont. Canada, is in charge of Frank Powers.

The Moffatt Stove Company of Weston, Ont. Canada, are to erect a three story addition to their plant. This will contain a foundry and new nickel plating department.

The Independent Scale Company are to build a factory at Asheville, N. C., for the manufacture of scales. The cost is estimated at $18,000.

The Dobel Mfg. & Plating Co., has been incorporated in Buffalo, N. Y., for carrying on the jobbing plating and polishing business. A plant will be equipped.

The Robert Mitchell Company of Montreal, Canada, manufacturers of plumbers' brass goods, as well as other goods of a similar kind, are erecting an iron foundry on Belair Ave.

A large addition to the Solvay foundry plant of the Frazer & Jones Company of Syracuse, N. Y., is to be made. The cost is about $50,000. Saddlery and other hardware are manufactured.

The Tottenville Copper Co., of Tottenville, Staten Island, N. Y., manufacturers of ingot copper, are to build an addition to their plant, and which will be 50 x 90 feet. It will be located on Church St.

Dean Clark, formerly with the Yale & Towne Mfg. Co., of Stamford, Conn., and the Smith Premier Typewriter Co., of Syracuse, N. Y., has become factory manager for the South Bend Watch Company of South Bend, Ind.

Lacquer manufacturers and others who use lacquers, should bear in mind that the Albany Chemical Co., of Albany, N. Y., are manufacturers of acetone amyl-acetate, fusel-oil, acetone oil and soluble cotton solutions. Particulars and prices will be given upon application.

The name of Smith & Richardson of Attleboro, Mass., manufacturers of the celebrated "Imperial Polishing Tank" for use with steel balls or for tumbling or tubbing work without them, has been changed to the Smith, Richardson Company. The business remains the same and the change is one of name only. Their machines have recently been improved.

The American Ring Company has been incorporated in Providence, R. I., with a capital stock of $25,000 to manufacture cheap jewelry and particularly rings for the ten cent trade. The factory is at 12 Beverly St. The incorporators are Francis E. Havens, James H. Haven and Maurice Marks who is also superintendent.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98 99% | lb. | .22 |
| Acid, Acetic, pure, 30% | lb. | .07 |
| Acid, Arsenious, White Arsenic | lb. | .10 |
| Acid, Benzoic | lb. | .55 |
| Acid, Boracic (Boric), pure | lb. | .12 |
| Acid, Hydrochloric, see Acid, Muriatic. | | |
| Acid, Hydrofluoric, 30% | lb. | .04 |
| Acid, Hydrofluoric, 50% | lb. | .10 |
| Acid, Muriatic, 20° | lb. | .02 |
| Acid, Muriatic, c. p., 20° | lb. | .07 |
| Acid, Nitric, 38° | lb. | .05⅝ |
| Acid, Nitric, 40° | lb. | .05⅞ |
| Acid, Nitric, 42° | lb. | .06¼ |
| Acid, Nitric, c. p., | lb. | .08 |
| Acid, Sulphuric, 66° | lb. | .01¾ |
| Acid, Sulphuric, c. p. | lb. | .06 |
| Alcohol, Wood | gal. | .57 |
| Alcohol, Denatured | gal. | .62 |
| Alum | lb. | .04 |
| Aluminum, Metallic, in Ingots | lb. | .24 |
| Ammonium Sulphate | lb. | .07 |
| Aqua-Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | lb. | .04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | lb. | .06¼ |
| Ammonia Water, c. p. | lb. | .08 |
| Ammonium Carbonate, lump | lb. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | lb. | .12 |
| Ammonium Hydrosulphuret | lb. | .30 |
| Ammonium Sulphate | lb. | .06 |
| Ammonium Suphocyanate | lb. | .50 |
| Amyl Acetate | gal. | 3.50 |
| Antimony | lb. | .08½ |
| Arsenic, Metallic | lb. | .10 |
| Arsenic, White (Acid Arsenious) | lb. | .10 |
| Argols, White (Cream of Tartar) | lb. | .31 |
| Asphaltum, Commercial | lb. | .05 |
| Asphaltum, Egyptian (Bitumen) | lb. | .30 |
| Benzine | gal. | .16 |
| Benzol, Pure | gal. | .50 |
| Bismuth, Metallic | lb. | 2.15 |
| Bitumen, see Asphaltum. | | |
| Blue-Vitrol, see Copper Sulphate. | | |
| Borax, Crystals or Powdered | lb. | .10 |
| Borax Glass | lb. | .30 |
| Cadmium, Metallic | lb. | .85 |
| Carbon Bisulphide | lb. | .10 |
| Calcium Carbonate (Precipitated Chalk) | lb. | .10 |
| Chrome-Green | lb. | .50 |
| Copper, Lake, (carload) | lb. | .15¼ |
| Copper, Lake (case) | lb. | .15½ |
| Copper, Electrolytic, (case) | lb. | .15⅜ |
| Copper, Electrolytic, (carload) | lb. | .15⅛ |
| Copper, Casting, (carload) | lb. | .15 |
| Copper, Casting, (case) | lb. | .15¼ |
| Copper Acetate (Verdigris) | lb. | .35 |
| Copper Carbonate, dry | lb. | .16 |
| Copper Sulphate (Blue-Stone) | lb. | .06 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | lb. | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | lb. | .10 |
| Emery Flour | lb. | .04 |
| Emery, F F & F F F | lb. | .03 |
| Flint, powdered | lb. | .01 |
| Flour Spar | lb. | .01¼ |
| Fusel Oil | gal. | 3.00 |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | lb. | .30 |
| Gum Guiacum | lb. | .26 |
| Gum Mastic | lb. | .60 |
| Gum Sandarac | lb. | .35 |
| Gum Shellac, brown | lb. | .50 |
| Gum Shellac, white | lb. | .60 |
| Iridium | oz. | 85.00 |
| Iron Perchloride | lb. | .25 |
| Iron Sulphate (Copperas) | lb. | .05 |
| Lead Acetate (Sugar of Lead) | lb. | .15 |
| Lead, Pig | lb. | .04½ |
| Lead, Red | lb. | .12 |
| Lead, Yellow Oxide (Litharge) | lb. | .12 |
| Liver of Sulphur, see Potassium Sulphide. | | |
| Manganese, Ferro, 80% | lb. | .10 |
| Manganese, Metallic, pure | lb. | .75 |
| Magnesium, Metallic | lb. | 1.50 |
| Mercury Bichloride (Corrosive Sublimate) | lb. | 1.12 |
| Mercury, Metallic (Quicksilver) | lb. | .59 |
| Mercury Nitrate | lb. | 1.50 |
| Mercury Oxide, yellow | lb. | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | lb. | .08½ |
| Nickel Carbonate, dry | lb. | .60 |
| Nickel Chloride | lb. | .50 |
| Nickel Metallic | lb. | .45 |
| Nickel Sulphate, Single Salt | lb. | .20 |
| Nitre (saltpetre), see Potassium Nitrate. | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Paraffine | lb. | .15 |
| Phosphorus, yellow | lb. | .40 |
| Phosphorus, red | lb. | 1.10 |
| Pitch | lb. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Cloride | oz. | 46.00 |
| Platinum Metallic | oz. | 48.00 |
| [illegible] | lb. | .45 |
| Potash, Caustic | lb. | .06 |
| Potassium Bichromate | lb. | .14 |
| Potassium Bitartarate (Cream of Tartar) | lb. | .31 |
| Potassium Carbonate (Pearlash) | lb. | .10 |
| Potassium Chlorate | lb. | .15 |
| Potassium Cyanide | lb. | .25 |
| Potassium Iodide | lb. | 3.15 |
| Potassium Nitrate (Nitre or Saltpetre) | lb. | .10 |
| Potassium Permanganate | lb. | .17 |
| Potassium, Red Prussiate | lb. | .55 |
| Potassium, Yellow Prussiate | lb. | .35 |
| Potassium Sulphide (Liver of Sulphur) | lb. | .15 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | lb. | .70 |
| Pumice, Ground | lb. | .05 |
| Quartz, Powdered | lb. | .01 |
| Rosin, Yellow | lb. | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .59¼ |
| Silver Nitrate, crystals | oz. | .50 |
| Soda-Ash | lb. | .05 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | lb. | .15 |
| Sodium Carbonate (Sal-Soda), crystals | lb. | .02 |
| Sodium Hydrate (Caustic Soda) | lb. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | lb. | .45 |
| Sodium Hyposulphite ("Hypo") | lb. | .04 |
| Sodium Metallic | lb. | .90 |
| Sodium Nitrate | lb. | .05 |
| Sodium Phosphate | lb. | .09 |
| Sodium Silicate (Water-Glass) | lb. | .04 |
| Soot, Calcined | lb. | .15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | lb. | .05 |
| Tin Chloride | lb. | .43 |
| Tin, Metallic | lb. | .41 |
| Turpentine, Venice | lb. | .35 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal. | .15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | lb. | .45 |
| Wax, Carnauba | lb. | .70 |
| Whiting (Ground Chalk) | lb. | .02 |
| Zinc Carbonate, dry | lb. | .12 |
| Zinc, Chloride | lb. | .12 |
| Zinc, Sulphate | lb. | .06 |
| Zinc, (Spelter) | lb. | .05⅝ |

# THE BRASS WORLD AND PLATERS' GUIDE

VOL. IX. BRIDGEPORT, CONN., SEPTEMBER, 1913. No. 9.

**A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.**

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## Iron Molds for Casting Brass.

Large quantities of iron molds are used in the brass industry, both in the rolling mill and the brass foundry trades. In the rolling mill business, iron molds are used for casting the brass in the form of plates, rods, bars, billets and tube-shells which are afterwards rolled into sheet, rod, wire and tubing. In the brass foundry, iron molds are used for making ingots. For these molds, there is nothing which will take the place of cast iron. Semi-steel, malleable-iron and steel castings have all been tried, but they all fail to give the service of cast-iron and in addition are more expensive.

Contrary to the usual belief, any kind of cast-iron will not answer for these molds and many persons believe that all that is necessary is to obtain a smooth surface on the castings. This belief is entirely wrong and the brass rolling mill manufacturers are very particular about the molds they use. Almost any iron foundry can make iron castings, otherwise, they would not be able to remain in business, but to make a *good* mold for casting brass is another proposition. The requirements of a mold for casting brass are as follows:

1. The mold shall be composed of the *right* kind of iron This is the most essential requirement.
2. The mold shall have a good surface.
3. The mold shall be straight and flat.

Any kind of iron will not answer, and those who make a business of supplying these molds have special, soft iron for the purpose If the iron is not soft, the mold will crack sooner or later and with some specially hard irons, when the first heat of metal is cast in it. The matter is different from that of machinery castings, where strength is required, and for molds this quality is not essential. A soft iron stands the heat far better and lasts a long time. It has been found that an iron high in silicon and low in combined carbon, thus obtaining a soft iron which will not crack when the metal strikes it and which will last a long time as molds wear out only from cracking.

The surface of the mold should be smooth and free from flaws or adhering sand. If the surface is filled with slag or blowholes, then the casting will not leave the mold well and will be imperfect. The surface of the mold need not be polished and a good smooth casting, such as would be obtained in the best foundry practice is satisfactory. Pickling in hydrofluoric acid is frequently used to remove the sand and sand blasting is also good when necessary.

## Preventing the Rusting of Iron or Steel Previous to Electroplating.

In the electroplating of iron and steel it is always necessary to clean the surface from grease, oil rust and other foreign matter previous to plating, otherwise, of course, the deposit will not adhere to it.

The cleaning of the surface from such foreign matter leaves a chemically clean surface and one which is in the ideal condition for rusting. It is not uncommon to find a plater who will carefully clean rust from an iron or steel surface for the purpose of plating it, and then, before the actual plating operation takes place unknowingly allow it to rust again. No deposit will ever adhere to a rusty surface. This difficulty is quite a common one when the inexperienced attempt to plate steel knives.

There is no surface so apt to rust as a chemically clean one, and as it is impossible to plate a rusty surface, it will readily be appreciated that unless the cleaned surface is taken care of and taken care of right, the plating operation will be quite unsuccessful.

In plating iron and steel, after pickling or cleaning off the grease or other foreign matter, and the surface is in a chemically clean condition, the plating operation will be satisfactory if the article is carried, after being rinsed, directly to the plating tank as it then will not have an opportunity to rust; but if it is allowed to remain some time, as it is usually required to do, before plating, then trouble usually commences.

Iron or steel which has been cleaned and is ready for plating should *never* be allowed to dry; if it is, then it will invariably rust and cannot be plated. While the drying takes place the iron or steel surface will rust rapidly. As it is always impossible to plate the articles immediately after cleaning, and they must remain for some time previous to this operation, then some process is necessary for preventing rusting during such an interval.

Clean surfaces of iron or steel may be prevented from rusting by immersion in an alkaline solution of some kind. It does not matter just what this alkaline solution is, but it must be strongly alkaline. Among the substances that can be employed are Sodium carbonate, sodium bi-carbonate, potassium carbonate, caustic potash, caustic soda, or lime. These substances, of course, should be dissolved in water. The one which is most satisfactory is sodium carbonate (carbonate of soda or sal soda). This is cheap and readily dissolves in water. Lime-water can be used but is not as good as sodium carbonate for the reason that it is apt to leave a film of carbonate of lime on the work and this must afterwards be removed with weak acid. The sodium carbonate is the best substance for the purpose.

Chemically clean iron or steel surfaces, therefore, when immersed in a sodium carbonate solution will not rust and may be kept indefinitely if not allowed to protrude out of the solution. In this manner, goods may be preserved after cleaning and previous to plating, without any danger of rusting. For this purpose a weak solution only is required. Dissolve 1 oz. of sal-soda in 1 gallon of water and keep the iron or steel immersed in it and there will be no danger of rusting. The process, therefore is quite simple and is very extensively used.

Silver solder is far superior to spelter solder for brazing metals as it melts more readily, and produces a stronger and tougher joint. It is more extensively used than formerly as its advantages are being appreciated better at the present time.

# Treatment of Gold and Silver at the United States Assay Office in New York City.

The United States Assay Office in New York City has always been a great source of interest to the public. That a great metal refining plant, carrying on the smelting and refining business, should actually exist on Wall St., the great center of the money market of the Western Hemisphere, has always been a matter of astonishment. The fact remains, however, that such an establishment does exist and has been located there for many years.

The United States Assay Office is situated on Wall St., New York City. Next to it is the Sub-Treasury and directly across the street is the office of the famous banking concern, J. P. Morgan & Co. The building is an old one and has been in existence for close to a century and is one of the landmarks of New York City. The front of the building is shown in Fig. 1 and although recently remodelled and improved internally the outside appearance has remained unchanged. For many years, indeed up to a comparatively few years ago, all the gold and silver used by the Government in the manufacture of its coins were refined at this establishment, but lately the refining has been split up and a portion of it is carried on at the Mints. A fire damaged the Assay office a number of years ago and it was then undecided whether to sell the property or rebuild it and continue the business as in the past. It was finally decided to reconstruct the building and equip it with more modern appliances for the refining of gold and silver.

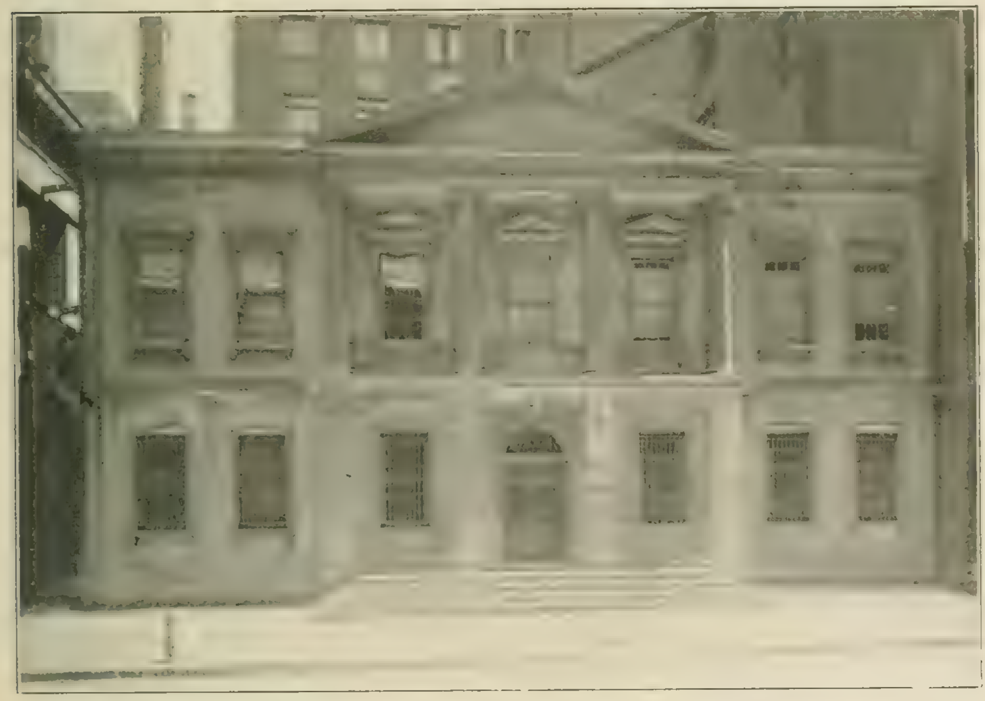

Fig. 1. United States Assay Office on Wall St., New York City, Recently Remodelled and Equipped with New Appliances.

Since the year 1866, the sulphuric acid parting process was used at the Assay Office for parting the gold and silver bullion, but during the reconstruction of the plant, this process has been abandoned and the electrolytic process has taken its place. Each process has advantages of its own, but it was decided that the electrolytic method was preferable and it is now used. The new Assay Office, if it may be called such, is equipped with the most modern appliances for the treatment of gold and silver bullion and separating the individual metals from it. The photographs herewith shown illustrate the plant as it exists today. That this plant has been rebuilt on Wall St., instead of in some other obscure location is explained by that fact that New York is the center of the money market of the United States and it was deemed necessary, by the Government officials, to have a refining plant in close proximity to the business, and this decision has met with the approval of the trade. Miners and smelters can still ship their base bars and bullion to New York, obtain advances on it and have it refined promptly. Shipping to other cities, where the refining could take place, would not be favorable, in the majority of instances, for the reason that the headquarters of the mines or smelter are very frequently in New York City.

The Government will purchase all the gold that is offered to it and pay $20.67 an ounce for it. It may or may not purchase the silver, but at any event it will refine it and return the exact amount offered. In most instances bullion, old jewelry, scrap or any other form of material offered to the Assay Office contains both gold and silver and it is the business of this office to separate (part) these metals into their individual condition and remove any foreign metals such as copper, tin, zinc, lead or iron.

As previously stated, the electrolytic method is used for refining both the gold and silver, and this process is now used at all the Government refineries where these metals are treated. After an extensive test, carried over several years, the Government experts decided to adopt this process in preference to the old sulphuric acid parting process in use since 1866.

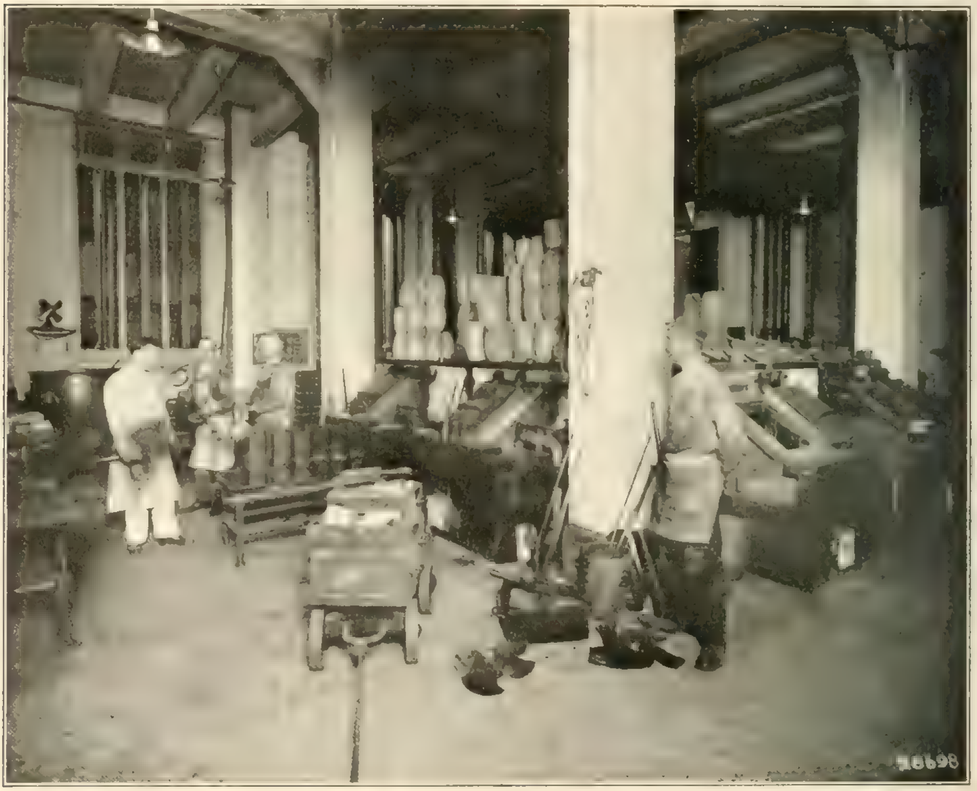

Fig. 2. Crucible Furnaces Used for Melting Silver and Casting Into Anodes for Electrolytic Refining.

The gold and silver materials that are received by the Assay Office are never pure metals, otherwise there would be no object of refining it. In some instances, of course, pure material might be offered in very small lots, but only in instances of an exceptional nature where it was desired to dispose of some special lot. The great majority of that offered at the office contains both gold and silver and may be of various kinds. The greater part, of course, is a "clean-up" from a mine-smelter, or that from an electrolytic copper refinery. Such material may be in the form of "base-bars" or "bullion" containing gold and silver and other metals. The only requirement imposed upon material offered is that it shall contain not less than 20 per-cent of gold and silver and shall be worth at least $100. These restrictions are placed upon the acceptance for the reason that small lots, which would not pay to work, are thus avoided.

When material, corresponding to the preceding restrictions, is received by the Assay Office, a receipt is merely given for it showing that it has been received. Any person may deposit it and no questions are asked. For this reason, much stolen material finds its way into the office and this fact has been a subject of more or less criticism in the past, but it is impossible to do otherwise. It is not the function of the Assay office to act as a detective and they are obliged by law to take what is offered. Did they know that the material was stolen, they would not receive it, of course, without investigation, but there is no way of knowing whether it has been obtained in this manner. By law, they are required to receive it.

When deposits are received by the Assay Office, they are melted down individually and a "dip" sample taken for assay. This method avoids any uncertainty obtained in boring a cast bar. Melting is necessary in order to mix the ingredients, but to obtain a sample from a cast bar means the uncertainty of segregation and liquation. By obtaining a sample while the metal is melted, means uniformity. The metal is dipped out with a small ladle and immediately poured into water to granulate and cool it. The shot is used for the assay. The customer receives his return on the result of this assay (the whole operation of melting and assays is done in about four days) and does not have to wait for the complete refining of the metal, which would,

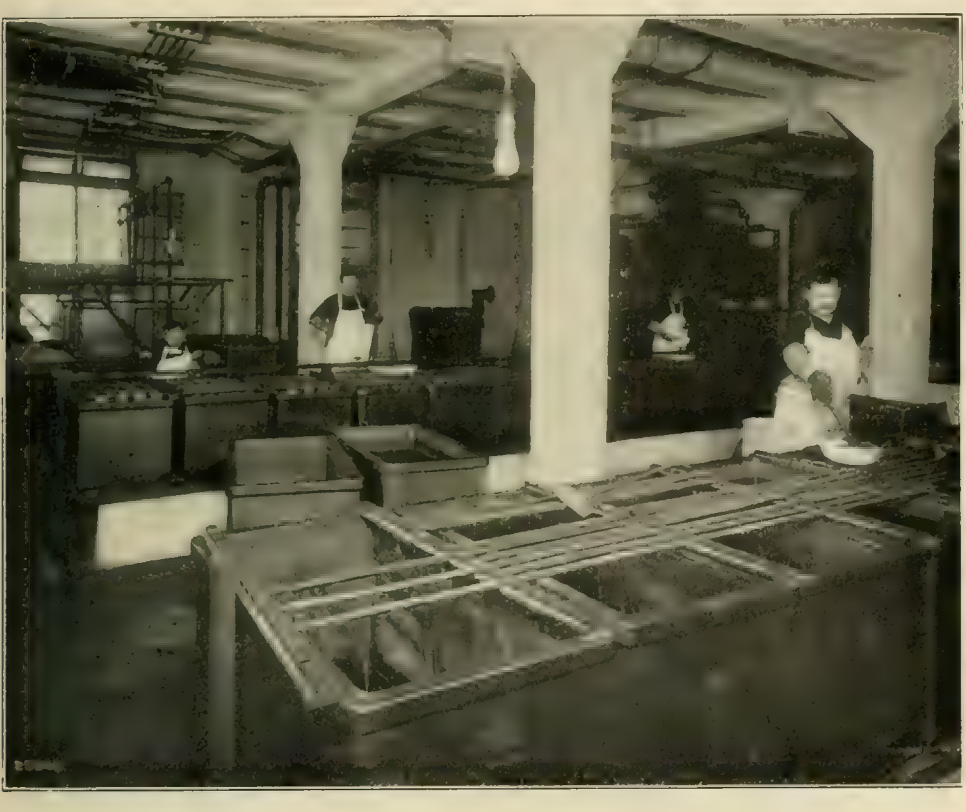

Fig. 3. Electrolytic Refining Room for Silver. Stoneware Tanks are Used.

of course, be impossible with small lots of metal.

If the deposit runs less than 900 fine in gold, it is used in the silver refinery, and if more than 900 fine in gold it is considered a gold proposition and used in the gold refinery. If it has been found that the deposit comes under the head of a silver refining material, then it is melted in the furnaces shown in Fig. 2 and in which the metal is cast into the form of an anode. The furnaces are of the stationary type and gas used for the fuel. It will be noticed that these furnaces are raised from the floor a considerable distance and this is a practice always followed in melting precious metals as it allows stirring, nitreing or other operations involving the mechanical treatment of the metal, to be done without difficulty.

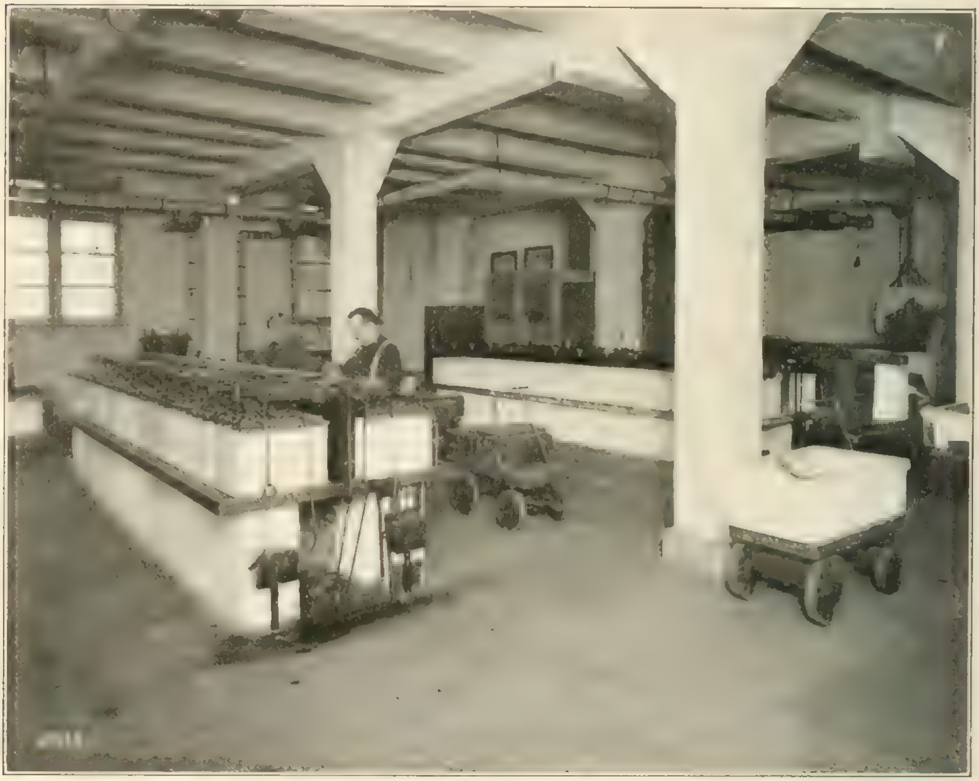

Fig. 4. Gold Refining by the Electrolytic Process. Porcelain Tanks are Used in this Process.

The material melted in the preceding manner is cast in iron molds, shown in Fig. 2, in the form of a thin plate, 16 inches long, 3 inches wide and [illegible] of an inch in thickness. These are used as anodes for the electrolytic refining of the silver. In order to use these anodes for silver refining, however, it is necessary that there be an excess of silver for the reason that unless the silver exceeds a certain amount it would be impossible to refine it in this manner. The proportions which can be used for this purpose are:

| | |
|---|---|
| Gold . | 250 to 400 parts |
| Base Metals | 150 or under |
| Silver | Remainder |

In melting, the fineness of the silver is raised, if necessary, by the addition of other material carrying this metal. Obtaining the right proportion of metal is an operation requiring much patience and experience and is done by carefully sorting the lots received and adjusting so as to obtain the proportions as nearly as possible. The base metals, when present in so large an amount as 150 parts, renders the electrolytic refining somewhat difficult. It is necessary to surround the anodes with muslin bags to prevent the slime from floating away.

The silver anodes, containing the gold and silver with the base metals, are suspended in the solution used for the silver refining. This electrolyte is composed of a solution containing 3 per-cent of nitrate of silver and 2 percent of free nitric acid. This strength must be continuously maintained. The tanks or "cells" used for them are shown in Fig. 3 and are composed of brown stone-ware. The agitation of the solution while the electrodeposition is going on is necessary and is accomplished by a small glass propeller in each tank operated by a motor.

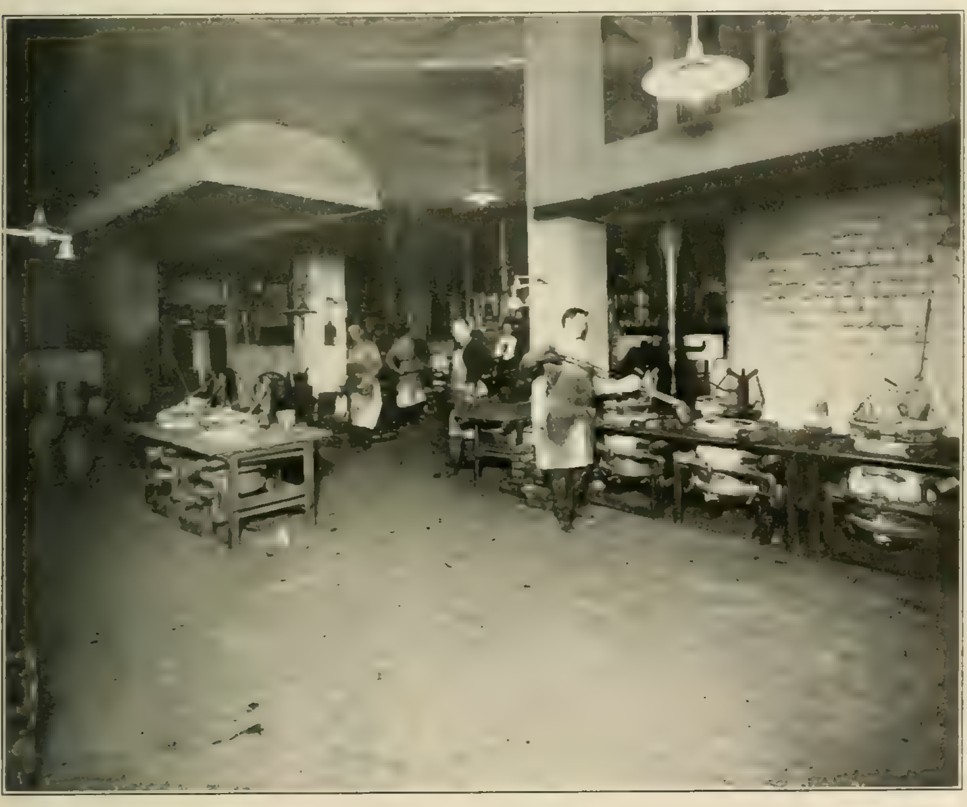

Fig. 5. Melting Gold Obtained from the Electrolytic Refining Process and Casting into Bars.

During the action of the current, in the electrolytic silver refining, the silver only is dissolved and the gold is left in the bag around the anode as a spongy material. The base metal enters the solution and is not deposited with the silver. The electrolyte needs renewing frequently on occount of the contamination with these base metals. The silver is removed from the impure electrolyte by means of copper and used over again for refining The solution from which the silver has been obtained is then thrown away.

The silver thus obtained is in a spongy or granular form and is washed free from adhering solution, dried and then melted into bars. With care it is obtained practically 999.5 fine. A very small quantity of gold finds its way into the silver, although it is watched as carefully as possible. It has been found impossible to prevent this, however, and all commercial silver silver bars thus produced will always contain this minute amount of gold.

The gold is left in the bags, surrounding the silver anodes in the electrolytic silver refining, in the form of sponge or finely divided gold. This is removed, dried and melted into gold anodes for further refining. This gold is not pure and contains some silver and base metals. Any original deposit that is sufficiently fine in gold is melted with the gold for making the anodes. The refining of the gold is not carried on in the same manner as the silver, although the electrolytic process is used. Porcelain tanks are used and which are 19 inches long, 14 inches wide and 12 inches deep. The electrolyte is composed of 30 grams of gold chloride per litre with a small amount of free hydrochloric acid. The anode used for this refining is 8 in. long, 3 inches wide and ½ inch thick. A novel way to prevent its becoming eaten away unevenly near the surface, is to make the anode wedge shaped. It is necessary in the refining of the gold, to keep the silver content of the anodes down to 5 per-cent; if above this amount, it forms an insoluble silver chloride which will finally give off chlorine gas and effect the working of the solution.

This adherent chloride of silver was formerly scraped off by hand, but it is now removed in a very novel manner. An alternating current is used in connection with the direct current with the result of producing a pulsating current through the solution which not only keeps the anode clean, but lessens the quantity of hydrochloric acid used. A current density of 70 amperes per sq. foot is used for the refining of the gold. By this is meant the direct current. The equipment for the electrolytic refining of the gold is shown in Fig. 4.

The spongy gold which deposits at the cathode in the electrolytic refining of the gold anodes, is washed free from electrolyte and then melted down in crucibles and cast into gold bars for the trade. Gold produced in this manner is of high purity and surpasses any obtainable by other refining processes. It is very much purer than the gold obtained by the old sulphuric acid process for the reason that it does not contain as much silver. Gold produced by the electrolytic refining process is almost chemically pure and will run, in many instances 999.9 in fineness.

In the refining of the gold by the electrolytic process, any platinum or palladium in the gold goes into the solution and remains there. After a time, when this electrolyte becomes so filled with base metals as to render it impossible to use it further, it is siphoned off and treated with sal-ammoniac and the platinum precipitated as ammonium platinic

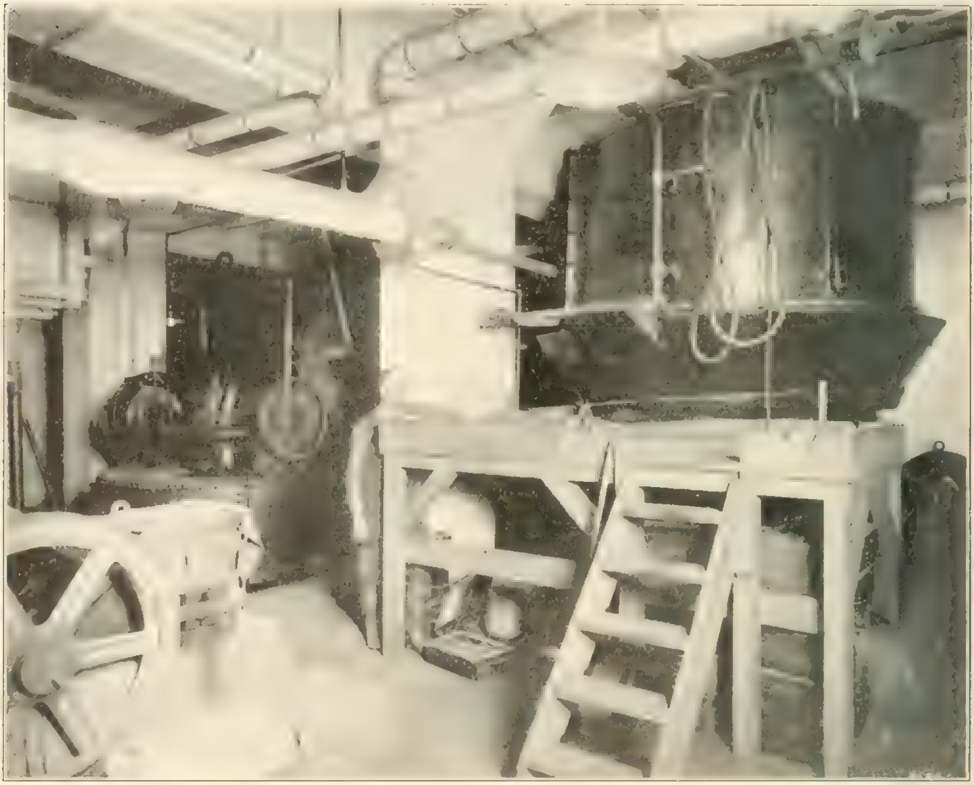

**Fig. 6. The Sweeps Room in which the Sweeps are Ground and Screened.**

chloride. This is then filtered off and dried. Any palladium in the solution is then precipitated in the clear liquid by adding some potassium chlorate and potassium permanganate which precipitates red palladium ammonium chloride. This salt is filtered out and dried. Both these salts are sold, when a sufficient quantity has been accumulated to the highest bidder. The depositor of the original material, in which these metals may have been present, receives nothing for them. They are usually present in so small an amount that to make any returns on them would be impossible in the ordinary way. The amount of these rare metals obtained, however, has become considerable and from $50,000 to $100,000 worth, it is stated, are now produced annually. The melting of the gold is carried out in crucible funaces, shown in Fig. 5.

The use of both gas and oil is provided for in melting in the Assay Office and the employment of this duplex system has been undertaken as a safeguard. Oil is used for the purpose of economy in melting, but some of the furnaces are equipped with a gas burning arrangement so that in case oil cannot be obtained, gas could be used. A severe snowstorm or other contingency might make this change from oil to gas necessary. The entire furnace equipment of the new Assay Office has been supplied by the W. S. Rockwell Company of New York City, the well known furnace engineers, who were given the task of supplying all the special furnaces required.

In order to take care of any precious metals which might be carried off in the wash or rinse waters from the various operations contingent upon the electrolytic refining, a large settling tank has been installed in the basement, and in this tank any mechanically suspended gold or silver will settle and can finally be recovered.

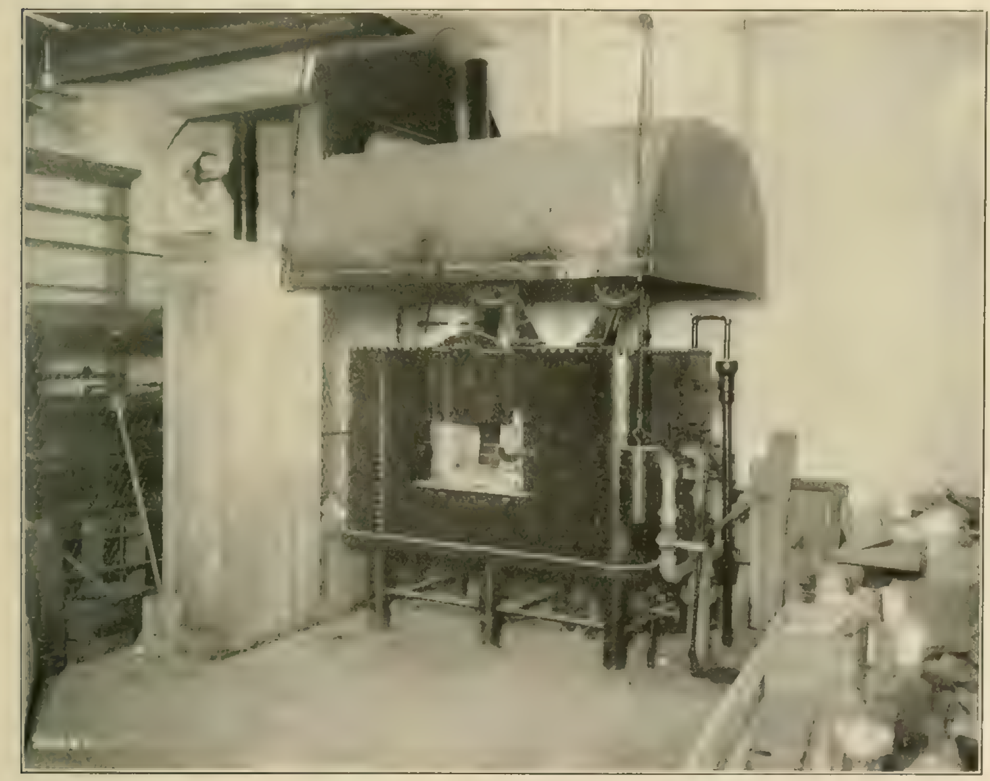

**Fig. 7. Reverberatory Furnace for Cupelling or Similar Uses.**

In any establishment treating the precious metals, the caring for the sweeps and other waste materials is a very important item as a large loss will take place unless carefully looked after. The sweeps department has recently been installed in the cellar of the

Assay Office and consists of modern equipment. The sweeps are first crushed in a jaw crusher to a diameter of about half an inch or less. The next operation is to grind the sweeps, thus crushed, to a 60 mesh fineness. The grinding is carried out wet and the grinder is of the Chili mill type in which the pan remains stationary and two rolls revolve in it. The material is next dried and is subject to agitation while drying so that they will not bake on the bottom. In Fig. 6 is shown the sweeps room.

In Fig. 7 is shown a reverberatory furnace that has been installed in the Assay Office and is used for special work, such as cupelling base bullion that contains too great a quantity of base metals to allow refining in the ordinary way. It can also be used for nitreing base bullion which requires such treatment to bring it up to the necessary fineness for electrolytic refining.

The plant has been made completely fireproof and will be free from danger in this respect. It is now believed to be the most modern of its kind in existence. Some very novel features have been introduced, both in the melting and refining by the electrolytic process, and among the latter is the employment of the alternating current to keep the anodes free from silver chloride in the electrolytic refining of the gold. As far as known, the alternating current is not used in the electrodeposition of metals in any other plant, and while it cannot be employed, of course, for the regular depositing, on account of its constant change in polarity, it is this very property that renders it of value in the refining of the gold in conjunction with the regular direct current.

## Determination of a Hot Galvanized Surface.

It is frequently desirable to determine whether a galvanized surface has been produced by the hot galvanizing process or by electrogalvanizing. To ascertain whether the coating is one or the other, a German investigator proposes the use of the microscope for this purpose.

The presence of crystalline forms upon the surface, due to an iron and zinc alloy, it is stated, is considered evidence that the hot process was employed for the galvanizing.

## Osmium-Platinum; a New Platinum Alloy.*

**By F. Zimmermann.†**

Of the several metals of the platinum group, platinum, palladium, iridium and rhodium have been most generally employed in the industrial arts, either alone or in combination as bivalent alloys. Of the latter, iridium-platinum is the best known, but the growing scarcity of iridium has led to the search for other combinations of the metals of this group yielding alloys possessing physical and chemical properties of equal if not greater value. The rarer metals of the platinum group are not easily obtained in great purity, and because of this fact but little success has heretofore been obtained when combining them as bivalent alloys. Furthermore, the strong affinity of osmium for oxygen has increased the difficulty of making alloys of it with other metals in definite proportions. After much experimentation by the author, highly refined platinum and osmium have been successfully combined in widely varying proportions yielding alloys of commercial value. While the two metals may be combined in almost any proportion, alloys containing from 1 to 10 per-cent of osmium and 99 to 90 percent of platinum are chiefly used.

Great purity of the components is essential, as the presence of small percentages of other elements appears to be very detrimental to the properties of the resulting alloy. According to the chemical and physical behavior, it seems that one part of osmium in an alloy with platinum will take the place of two and one-half times its weight of iridium. The osmium-platinum alloy is very acid-resisting, and for this reason may be of great service in the electrochemical industry. Its electrical resistance is considerably higher than that of an iridium-platinum alloy of the same percentage composition. The alloy further possesses great hardness and tensile strength. Wires of the finest sizes are drawn with comparative ease. A thorough study of the alloy is in progress and definite results of tests may be of sufficient interest for a later paper. The alloy has been patented.

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*A paper presented at the Meeting of the American Electrochemical Society, held at Denver, Col., Sept. 9-11th, 1913.

†Research Laboratory of Baker & Co., Newark, N. J.

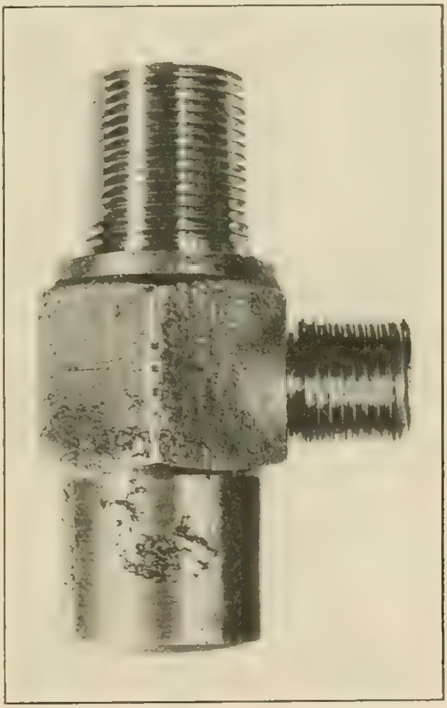
# Causes of Failure of Manganese-Bronze Castings for Valves.

Although manganese-bronze is a much stronger material than ordinary tin bronze, it is unsuited for use in the manufacture of valves or other castings to stand pressure. Contrary to a pretty general belief, a strong metal is not always best for such work and in the case of manganese-bronze its use for such work is always accompanied with difficulty. This difficulty is caused by the presence of dross in the casting and the appearance of a casting containing it may be seen in the illustration herewith shown.

The reason for the failure of manganese-bronze for work to stand pressure is the fact that it contains aluminum, and without it the metal cannot be cast. It is necessary for successful casting, and if omitted from the manganese-bronze mixture, a casting very unsound is obtained. Aluminum, therefore, is *absolutely* essential for the successful casting of manganese-bronze.

When aluminum, or any alloy containing it, is melted, oxidation takes place and this oxide is the cause of the whole trouble. The oxide intermingles with the metal that is poured into the casting and causes leakage. This may be appreciated by reference to the manganese-bronze casting herewith shown. The presence of the dross is quite apparent and it may easily be understood that such foreign material will allow any liquid, such as water, to pass through when pressure is applied.

The question is frequently asked: Can valves, or other castings to stand pressure, be made successfully of manganese-bronze? In other words, is the making of manganese-bronze castings to stand pressure a commercial proposition? It can positively be said it is not. The castings can be made and good ones can be obtained, and when such castings are good they cannot be excelled; but the whole difficulty lies in the number of bad castings produced. In making castings from any metal there will invariably be some bad ones, but with ordinary steam-metal and with good practice the loss will be small, frequently as low as five per cent. This loss is also quite uniform so that a calculation can be made as to the loss from bad castings. In the case of manganese-bronze, however, the loss in the shape of bad castings is so variable that it becomes a matter of considerable uncertainty. At one time a hundred castings may be made and half of them may be good; and another time ninety per cent. of them may be bad. It will be readily appreciated, therefore, that with such uncertainty any calculation in regard to the cost will be impossible. The only way is to figure the highest percentage of bad castings obtained and then, of course, the cost will be so high as to be prohibitive. It is this very fact that renders the casting of manganese-bronze so uncertain and the manufacture of valves, or other castings to stand pressure so costly.



**Manganese-Bronze Casting Showing that the Cause of Leakage is the Dross.**

The question of the successful casting of manganese-bronze in the form of castings to stand pressure is one of foundry practice as may readily be appreciated. The matter resolves itself into one of keeping the dross out of them. If one that leaks be cut at the leaky part, dross will always be found in it. It may frequently be small, however, but it will always be found. In the manganese-bronze casting herewith shown, the amount of dross is excessive, although its effect, either in large or small amounts is the same. The dross forms channels through which water or other liquid can pass. If this dross can be kept out of the castings, then they will stand the desired pressure.

The matter of keeping the dross out of the casting is an important one, whether it is to stand pressure or not and resolves itself, as previously mentioned, into a question of foundry practice. The operation of making good castings depends upon the following:

1. The metal must be poured at as low a heat as possible. The hotter it is the greater the amount of dross. As a usual thing, the metal should be poured at a temperature so that no smoke is given off from the undisturbed surface. If however, the metal is agitated with the skimmer, then a slight amount of spelter smoke is evolved. This rule applies to the pouring of castings except those which are small or thin. Many founders are unable to obtain good castings because they utterly negelct this proper pouring temperature. If the manganese-bronze is poured at too high a heat and so that the metal is smoking freely from the undisturbed surface, then the castings will be full of dross. Keep the heat down, and the castings will be good. There is danger, however, of carrying the temperature too low and so that the metal is actually pasty when poured. In this condition, of course, the castings will not be good. An experienced founder, however, can easily avoid any such condition

2. Another common fault in casting manganese-bronze is in not casting the metal "quietly". By this is meant any unnecessary agitation of the metal while being poured. On account of containing aluminum, manganese-bronze forms dross which is, of course, oxide. The oxide is principally oxide of aluminum. In pouring, the more the metal is agitated, the greater the quantity of dross for the reason that any new surface of the melted bronze that is exposed to the air will immediately form more oxide. This may be realized by violently agitating the bronze while in the crucible by stirring. The more the metal is stirred the greater will be the amount of dross formed. It is evident, therefore, that the metal should not be agitated any more than necessary for pouring it into the mold, and that the more quietly it can be poured the less the amount of dross. In pouring, the mouth of the crucible or ladle should be held as near to the pouring gate as possible so that there will be no splashing or other violent agitation, and the melted bronze should be poured slowly and evenly. By following out this practice, a minimum amount of dross will form.

3. The gating of the pattern and length of runner are very important items and if carefully adjusted, the castings will come better. The runner should be as long as possible and also [illegible] dross there is in the metal when it enters the mold will remain in it. A short runner, such as would answer admirably for composition or other kinds of the tin bronzes, will not do for manganese-bronze. By employing a long runner, it is possible to keep the greater part of the dross, which forms in pouring, in it. For large castings a horn sprue should be used as by employing it the metal will fill the mold from the bottom and the dross will then be kept back to the fullest possible extent. The use of the horn sprue, whenever it can be employed, will insure the best possible castings and those as free from dross as can be produced. All castings, however, cannot be made in this manner.

4. Keep the sand as dry as possible so that there will be no bubbling or agitation of the metal when it enters the mold. With the sand too wet or too closely rammed, the metal is apt to "blow" when it strikes it and agitation results with the accompanying formation of dross. Whenever melted manganese-bronze is agitated dross results, and if this is always considered, less difficulty will occur.

The making of manganese-bronze castings for pressure work, therefore, is a difficult matter and an operation that should be shunned where possible as it will be found more economical to make them of a good tin-bronze, such as steam-metal or an 8-10-2 mixture. In case it is necessary to make the castings of manganese-bronze, then by following the preceding directions the minimum amount of loss can be obtained, but it should be borne in mind that the percentage of bad castings of manganese-bronze will be far greater than would ever be expected from steam-metal castings. As a matter of economy the manufacture of manganese-bronze castings to stand pressure should never be attempted, but there are times, perhaps, when it is necessary and then the casting will have to be done and the best made of what is called a "bad job". The most unsatisfactory part of the whole operation will be the uncertainty of the loss from leaky castings. Castings which will have an excellent appearance and which, for ordinary work, would be considered quite satisfactory, will often leak when a low pressure is put upon them and caused, as previously stated, by the presence of a small amount of dross in the walls of the casting. This dross may not be visible to the naked eye, but will allow water to pass through when pressure is applied.

## Applications of Calcium.

At the recent Foundry Exhibition at Leipzig a display of metallic calcium, as used for improving and purifying molten metals, was exhibited by the Bitterfeld Electro-Chemical Works. Metallic calcium, produced by a patented electrolytic process from the molten chloride, is industrially applied as an energetic purifying agent. Its property of combining with oxygen, nitrogen, and hydrogen with rise of temperature increases the temperature of the molten bath, and at the same time causes vigorous ebullition, whereby the gases, oxides, and portions of slag, dissolved or mixed with the bath, are brought to the surface. Owing to the complete purification a denser casting with a homogenous texture is obtained. As calcium does not alloy with iron, but always goes into the slag, an excessive addition never becomes injurious, as in the case of other refining agents, such as aluminum. The latter readily alloys with iron and so remains in the bath, causing an abundant separation of graphite, which makes the iron pasty and considerably prejudices the quality of the material. This is avoided by the addition of calcium. Calcium also promotes a thorough mixing and uniformity of the molten bath, thus permitting the use of iron which cannot generally be employed without danger to the good qualities of the product. For the complete deoxidation and refining of a normal melting, an addition of about 50 gm. of calcium per 100 kilogrammes is required. Calcium is also generally recommended for use in the founding of copper and other metals, but then the addition of calcium should not exceed 0.05 per cent. Metallic calcium is sold in airtight tin boxes, as it readily oxidizes on exposure to the air.—*The Ironmonger.*

## Bright Silver Plating and How to Accomplish it.

Although it has long been known, bright silver plating was not extensively used until the advent of soft metal coffin hardware. This is made very cheaply and very little silver is put upon it so that the use of a bright silver deposit is quite essential in the matter of cheapness, otherwise it would be necessary to buff the deposit and a light silver deposit would be buffed off; and at the same time a deposit sufficiently heavy to allow buffing would render the goods too expensive.

For a long time coffin hardware was comparatively the only use for bright silver plating, but within the past few years its employment has been greater and a number of large establishments are using it upon flatware and hollow-ware. The use of bright silver plating at the present time may be said to be quite extensive.

The production of a bright silver deposit is accomplished by means of bi-sulphide of carbon. The presence of sulphur in the silver solution seems to be essential to the formation of this bright deposit and bi-sulphide of carbon is, as far as known, the best substance for introducing it. Why the infinitesimal amount of sulphur introduced into the solution should cause the deposit to become bright is unknown, but the fact remains that it is changed to a bright deposit.

Although called a bright deposit, it is, in reality, not bright in the sense that a polished surface is bright. A "smooth" deposit is a better term for it as the silver is smooth and somewhat cloudy. It is sufficiently smooth, however, so that a slight touch to a rag buff will bring out the desired lustre.

In carrying out the bright silver deposition, the ordinary silver solution is used and to it is added bi-sulphide of carbon. The current density may be greatly increased when a bright solution is employed for the reason that it does not show the tendency to "burn" like a dead deposit. This fact, together with dispensing with scratch brushing renders the use of a bright deposit less expensive to produce. The current density can be increased about three-fold and the time of deposition thus decreased the same amount. Three times the amount of work per day from a tank can be obtained over that produced when a dead deposit is employed.

The method of adding the bisulphide of carbon is as follows

Place a quart of the regular silver plating solution in a bottle and then add 10 drops of bi-sulphide of carbon. Shake from time to time and allow to stand over night. In the morning a black sediment will be found in the bottom of the bottle. The clear solution should then be poured off from it and kept tightly stoppered in a glass bottle for use. The black sediment should be thrown away.

To change an ordinary silver plating solution from "dead" to bright, add about 1 oz. of the stock bi-sulphide of carbon solution, previously made, to each 10 gallons of solution. The whole solution should then be thoroughly mixed before using.

It will be necessary, from time to time, to replenish the solution with additions of the bi-sulphide "stock" solution. The point when this is necessary may be ascertained from the appearance of the silver deposit. When it is not even, but shows patches of a dead deposit or inclines to dead, then a little more of the "stock" bi-sulphide solution should be added. Care must be taken not to overdo this addition or harm will result.

The electrodeposition can be carried on in the regular way and if desired a stronger current may be employed. In fact, it is customary to use a stronger current in regular work for the reason that a more rapid deposition takes place without danger of "burning" the deposit.

A bright deposit of silver is much harder than a dead deposit, but yet it responds to the burnisher in a satisfactory manner. On account of its hardness it wears longer than an ordinary white silver deposit. The color of a bright deposit is different from the regular silver and it has a slight bluish shade which is, of course, more perceptible on the deposit when it comes out of the solution and has not been buffed. After buffing, however, the shade is almost imperceptible. It has been assumed, on account of the slight amount of sulphur in the deposit that the silver will tarnish more readily, but experiments have shown that it tarnishes no more rapidly than other silver.

Some experienced silver platers do not advocate the use of a bright silver deposit upon flat-ware, although it is quite necessary on coffin hardware and some kinds of hollow-ware. It is particularly useful on work containing a figured pattern as a scratch-brush does not reach the background upon this class of work. With a bright silver deposit, however, scratch-brushing is obviated. The only object of using it upon flat ware is to allow a more rapid deposition of the silver and in some cases this has proved to be quite advantageous and a greater quantity of work turned out from a tank per day.

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## Effect of Foreign Metals upon the Rolling Property of Zinc.

The results of some experiments upon the rolling properties of zinc were recently made by E. Prost and A. Var de Casteele in *Bull. Soc. Chim. Belg.* 1913, pages 175-189. Ingots weighing 40 lbs. were made and in which the various metals were incorporated. The zinc had the following composition.

| | |
|---|---|
| Zinc ............ | 98.85 to 98.60 per cent. |
| Lead ............ | 1.05 to 1.25 per cent. |
| Cadmium ............ | 0.07 to 0.11 per cent. |
| Iron ............ | 0.03 to 0.04 per cent |

The following results were obtained.

Cadmium is harmful when present above 0.25 per cent. When over 0.50 per cent. rolling is no longer possible.

Arsenic increases the hardness and when 0.02 per cent. is present the hardness is marked. With 0.03 per cent the zinc becomes too brittle for use.

Antimony is less injurious than arsenic and when 0.07 per cent is present the hardness does not seem to be increased to any extent. However, when 0.02 per cent. is present the surface of the rolled sheet is striated so that it becomes unsaleable.

Tin is objectionable when present in an amount of 0.01 per cent. and when 0.03 is present the zinc cannot be rolled.

Copper has no appreciable hardening effect until it reaches 0.08 per cent. and when it reaches 0.19 per cent. the zinc cannot be worked.

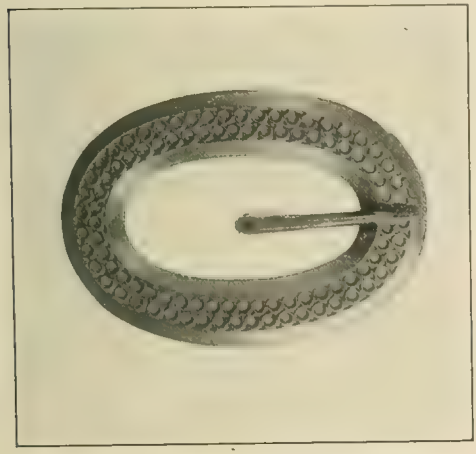
Iron is permissible in an amount up to 0.12 per cent. but this is easily reduced in refining.

Lead is not injurious when from 1.00 to 1.25 per cent. is present and an increase does not appear to affect the rolling qualities. The lead, however, has the objection of separating in patches which remain unalloyed with the zinc in the sheet and thus injures it and renders it unsaleable.

The presence of two or more impurities together have the same effect as each.

## The Persulphate Black on Brass, Copper and Bronze.

The production of a black color on brass, bronze or copper by means of potassium persulphate was first described in The Brass World, January 1911, page 17. The process has proved quite satisfactory and as no current is employed, but the solution is used as a dip, it supples an easy method of obtaining a black color on a large line of commercial goods. The color obtained is equal to that obtained by black nickel and it is much easier to produce. Potassium persulphate is not particularly expensive and new methods of producing the persulphates has reduced their cost.



**Brass Buckle Finished In Black by Persulphate Method.**

The persulphate is used in conjunction with caustic soda and water and the solution is heated to boiling when used. For coloring brass (yellow) a stronger solution is necessary than for copper or bronze. The following are the proportions employed:

*Solution for Yellow Brass*

| | |
|---|---|
| Water .................... | 1 gallon |
| Caustic Soda ............. | 8 oz. |
| Potassium Persulphate ..... | 1 oz. |

*Solution for Copper or Bronze.*

| | |
|---|---|
| Water .................... | 1 gallon |
| Caustic Soda ............. | 4 oz. |
| Potassium Persulphate ..... | 1 oz. |

The solution is heated to as near the boiling point as possible and the article to be colored, previously cleaned from grease and, if possible, with a buffed surface, is immersed in it and allowed to remain until the desired black color is obtained. This may take from 5 to 15 minutes.

The black color is obtained by the liberation of the oxygen from the persulphate and which, apparently produces a black oxide of copper on the surface. If the color is slow in forming, as it will be after the solution has been used, then a little more of the potassium persulphate should be added. The proportions of the ingredients used need not be exact.

The black color obtained is very adherent and may be buffed as desired. If the surface of the metal, previous to coloring is buffed, however, then the surface will be highly polished after the black color has been obtained.

Articles of steel or other metals may be copper or brass plated and colored in the same manner as solid metals, provided, of course, that a sufficiently heavy deposit is put on.

## The Electrodeposition of Antimony.

The electrodeposition of antimony is rarely attempted, and as far as known, is not used commercially. According to Roseleur, "the deposit resembles black platinum or oxidized silver and may be advantageously used in place of either in many cases."

Roseleur says: "Electrodeposited antimony possesses all the brightness of polished cast-iron. Its dead lustre is a slate gray and it may easily be scratch-brushed or polished; however, during the last operation the tool slides as upon a slightly greasy substance. Such deposits are obtained by boiling for about 1 hour in a porcelain dish or enameled cast-iron vessel, the following substances:

| | |
|---|---|
| Water .................... | 1 gallon |
| Carbonate of Soda ........ | $1\frac{1}{2}$ lbs. |
| Sulphide of Antimony ..... | $\frac{1}{2}$ lb. |

The sulphide of antimony should be finely powdered. The boiling solution is filtered through paper or a fine cloth, and by cooling, deposits a reddish yellow powder of kermes or oxysulphide of antimony. This powder is again boiled in the same liquor and the new liquor is the antimony bath. It is, therefore, necessary to use the bath constantly boiling. For the anode* we use either a plate of antimony or a platinum wire."

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*(A steel plate or one of carbon can also be used—*Editor.*)

# Metallographical Researches in Egyptian Metal Antiquities.*

### By B. Garland, F. C. S.

[illegible] mospheric temperatures that the microscopic examination of metal objects made by the ancient Egyptians in the earliest times should be of considerable value. These metal objects may be divided into two classes, i.e. those of a useful character, such as tools, and those of a purely ornamental design. The latter class includes statues and similar articles, but these, being almost without exception extremely impure, were useless for the purpose of this investigation. Tools, however, were much more carefully made, and the Egyptians were fairly successful in keeping the deleterious impurities within low limits, though the analyses appearing in this paper will show that their alloys and metals will not bear comparison with our present day standards.

Much difficulty was experienced at first in obtaining suitable specimens, the general opinion being that it is almost sacreligious to cut up these antiquities, but the author eventually succeeded in obtaining a sufficient number for his purpose, and his thanks are especially due to Captains R. G. and F. G. Anderson, both of whom are keen and experienced collectors. He is also indebted to Sir Gaston Maspero, Director of the Egyptian Antiquities Department, for some specimens.

As to the authenticity of the articles it can be safely said there is no doubt, and though the actual period of origin cannot be assigned to several of them, they are all, with the exception of the Roman coin, certainly more than 2000 years old.

There has not been overlooked the possibility of articles of this nature having been at some time previous to their discovery subjected to heat by such means as conflagrations of cities and so on, and the author therefore has rejected all specimens that showed any evidence, external or internal (such as coarse crystallization, etc.) of having undergone any process of this nature. On the other hand, it [illegible] metal which had never been through any serious heat treatment, accidentally or otherwise, since its manufacture.

The metals and alloys dealt with in this paper are bronzes and impure copper, all of which may be regarded as solid solutions.

The first specimen was an old copper knife attributed to the XVIIIth dynasty, and therefore about [illegible]00 years old. It was of quite ordinary shape and was in a splendid state of preservation. Mr. W. B. Pollard B. A. kindly analysed it with the following results:

| | |
|---|---|
| Copper | [illegible] |
| Lead | [illegible] |
| Iron | 1.18 |
| Bismuth | [illegible] |
| Tin | [illegible] |
| Nickel and Cobalt | 0.26 |
| Arsenic | 0.81 |

A close microscopic examination of this knife showed that there was a difference in hardness between the cores and the matrix, but it was not readily perceptible before etching. At one time the author had reason to doubt whether the structure was really a "cored" one, or whether the more or less parallel light and dark markings were furrows produced by the emery and eventually revealed by the etching agent. That they were really "cores" was, of course, proved indisputably by their disappearance on annealing and also by the chemical analysis subsequently made. The author, therefore, holds that the knife was hammered into shape cold from a cast rod of impure copper. Further circumstantial evidence that the knife would be hammered cold is afforded by the fact that by this means would the best cutting edge be obtained.

There seems to be no doubt whatever that the knife had never been through any heat treatment at a temperature high enough thoroughly to anneal it, though of course we cannot say that the recrystallization was not due to work being done on it at a slightly elevated temperature. No appreciable diffusion or crystal growth has taken place during its lifetime.

The next specimen was a small bronze chisel about three inches long, of a normal shape, such as possibly a jeweller would use in those days. It cannot be dated exactly, but there is no doubt as to its antiquity, and its age was at least 2000 years.

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*Abstract of a paper read at the Ghent meeting of the British Institute of Metals, held on Aug. 28th.

The "cores" showed especially well because the chisel was only hammered at the cutting edge, and the original structure had not been seriously damaged in the section taken for the micrograph given in Fig. 4. On examination with a higher power it was found that the dark cores had recrystallized, and a close inspection of the micrograph will show indications of it. The tin-rich matrix had, however, undergone no structural change. On thoroughly annealing the specimen, the cores disappeared and the surface became wholly crystalline with some twinning.

In Dr. Rose's paper on the "Annealing of Coinage Alloys" he stated that he thought old coins were struck hot and, therefore, are useless for the study of any recrystallization or crystal growth which might be due to age alone. A photograph showing the structure of a Roman coin belonging to the reign of Constantine (and which is therefore, about 1600 years old) is shown. This coin may have been struck hot, but not hot enough to promote diffusion, as the cores are still in evidence. This is the same effect as was found in the bronze chisel previously mentioned.

Mr. Pollard's analysis of the coin is as follows:

| | |
|---|---|
| Copper | 96.82% |
| Tin | 0.08% |
| Iron | 0.65% |
| Nickel | 0.65% |
| Arsenic | 0.09% |
| Silver | 1.71% |

Traces of gold, zinc, cobalt, lead and bismuth were found. A perfectly homogeneous structure on annealing was not to be expected from such an alloy, but the "cores" disappeared and the surface became crystalline with twin markings and slight amount of eutectic in places.

In considering a slightly different aspect of ageing, it is well known that when a metal or solid solution is hammered cold, the crystal grains are distorted and broken up, and a section of such a metal shows a multitude of lines.

The author was fortunate enough to obtain an ancient Egyptian spatula made from a bronze rod which had been annealed prior to being hammered into shape in the cold state, and had not been subjected to any heat treatment subsequently. It was shaped in the form of a circular rod 0.1 inch in diameter, about 3½ inches long, flattened out at one end A transverse section was cut through the rod and the structure due to the original hammering. The metal had not recrystallized after the cold work, but was apparently in the same state as when it left the maker's hands. It would seem that after being partially worked the spatula was annealed and that after further severe cold working it was not subjected to a second heat treatment. It is rather remarkable that the flow lines have been preserved to the present day, and that if the internal strains have been relieved by an ageing effect (which seems doubtful) these lines did not disappear at the same time.

On annealing at a low temperature the alloy recrystallized into a fine type of crystal grains, which, on increasing the temperature, grew in the usual manner.

It would, of course, not be safe to say that such recrystallization as was found to have occurred in the specimens mentioned in this paper was due solely to age, but of many specimens examined by the author not one has been noted which had not recrystallized in some part of its structure, usually in the copper rich part. Further, in the majority of samples the size of the crystal grains was of a very fine order.

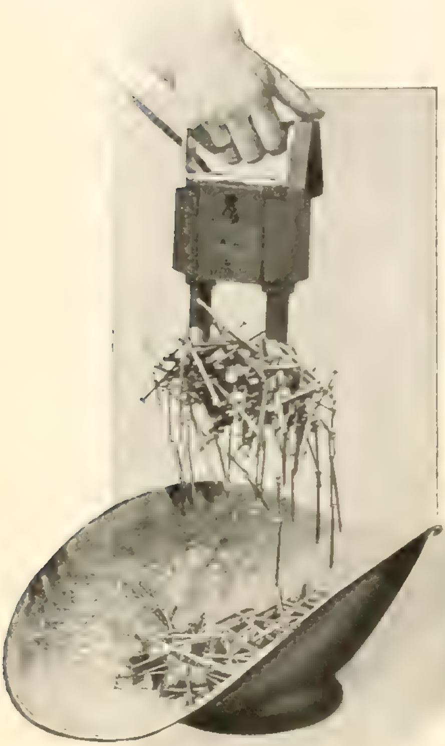
From the results of these investigations the author considers that the structural changes that take place in metals and alloys at atmospheric temperatures—in the absence of mechanical effects, such as vibration and so on—are trifling. It seems that to promote diffusion in a solid solution, or to increase the size of the crystal grains, a more or less elevated temperature is a *sine qua non.*

## Uniting Tungsten and Copper.

According to a recent British patent, copper and tungsten may be joined by melting the copper with boron so that it is purified, and then casting it in contact with the tungsten. The copper will then adhere to the tungsten. It is also stated that the copper and tungsten may be heated in a crucible, together with boron, to a temperature several hundred degrees above the melting point of the copper. Another method given is to heat the copper and tungsten in a vacuum furnace to about 1400 degrees Centigrade and then allowing the whole to cool in contact with each other.

## An Electro hand Magnet for Brass Foundry Use.

A magnet machine has been found indispensible for brass foundry use and is extensively employed. For some purposes, however, it is either too expensive or cannot be employed. One of this kind is in sorting copper wire. Such wire is always a high class of scrap metal, but there is manufactured at the present time a compound copper wire with a copper shell and a steel core. Some of this kind of wire will creep into good copper scrap at times and cannot be distinguished by the appearance. The hand magnet will separate it. There are other kinds of scrap, too that cannot be treated by the magnet machine, but which will allow separation by means of the hand magnet.



Hand Magnet for Use in the Brass Foundry.

The electro hand-magnet, herewith illustrated, is manufactured by the Cutler-Hammer Co. of Milwaukee, Wis., for hand use and the ordinary electric light current is connected with it. A direct current of 110 or 220 volts is necessary for its operation. To use it, it is simply connected with the electric current, by means of a socket and wire cord. A push button on it can be operated by the thumb so that the load on the magnet may be dropped at any time desired.

The magnet weighs seven pounds and is capable of lifting from 75 to 100 lbs. The current consumption is small and at 110 volts only about ½ ampere is consumed, while at 220 volts only ¼ ampere is used.

## A New Method of Obtaining a Black, Rust-Proof Finish on Iron or Steel.

A new method of obtaining a black, rust-proof finish on iron or steel has recently been patented by Frank R. G. Richards of Coventry, England (U. S. Patent, 1,069,903). The process can be applied to hardened steel for the reason that it is obtained in a solution and the work is not heated as it is in some of the other black finishing processes.

The process is carried out in the following manner: A solution is made up of

| | |
|---|---|
| Water .................. | 120 gallons |
| Manganese-dioxide ... | 3 lbs |
| Phosphoric Acid ...... (concentrated) | ½ lb |

The solution is placed in a suitable receptacle and heated to the boiling point. The iron or steel articles, previously cleaned, are immersed in it for from 30 to 90 minutes, when they are removed, wiped and oiled with linseed oil.

## Compound Tantalum and Platinum Metal.

Siemens & Halske Aktien Gesellschaft of Berlin, Germany, the large manufacturers of electrical goods, have recently patented a compound metal consisting of tantalum and platinum. The method claimed is to coat metallic tantalum with platinum by plating or otherwise. It is stated that the combined metal has all the advantages of both metals and is suitable for purposes for which tantalum has been closed on account of its property of oxidizing in the air.

It is stated that the improved metal welds very well with platinum, copper and a number of other metals.

## Making Porous Lead and Antimony Plates.

Professor H. T. Hannover, Rector of the Royal Technical College at Copenhagen, has sent us a copy of a brochure entitled "The Production of Porous Metals," from which we have abstracted and translated those parts which deal particularly with the mechanical operations involved in the process, which is mainly intended for the production of porous plates for electrical accumulators. It is based on the property exhibited by alloys, that the predominating metal solidifies first in cooling and leaves the eutectic disseminated in a still liquid form throughout the mass until the solidification point of the eutectic is reached.

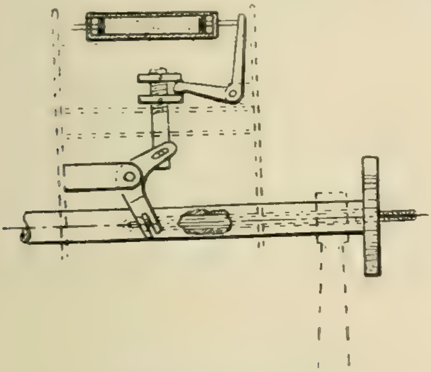


**Fig. 1. Method of Forming Porous Lead and Antimony Alloy.**

Conversely, during reheating, the eutectic melts first, on being expelled from the solid matrix by suitable means, leaving a porous mass of solid metal behind. In the case of lead-antimony alloys, the eutectic contains 87 per cent. of lead and 13 per cent. of antimony, so that with an alloy containing 96 per cent. of lead, about 27 per cent. of the lead will go to form the eutectic, which does not solidify until the mass is cooled down to 228° C., the maining 69 per cent. of lead having previously become solid. On reheating the mass, as, for example, a plate of metal, to the melting-point of the eutectic, and driving out the latter by centrifugal force or agitation, this 69 per cent. of lead is left in a porous condition, suitable for accumulator plates. A small proportion of the antimony remains in the mass, but that has practically no effect on the electrical capacity of the plates, and incidentally imparts a certain amount of strength to them.

### *Methods of Expelling.*

Various methods of expelling the liquid eutectic were attempted by Professor Hannover, such as by displacement with hot oil and carbon dioxide under pressure, but these having proved unsatisfactory, recourse was made to centrifugal force, two plates of the alloy being placed in moulds attached to the axis of the centrifugal machine by arms. The discharge side of the plates was covered with wire gauze backed by a grating, but then the surface of the plates was found to crack during the treatment. Investigation showed that this result was due, not to the expulsion of too much material, as had been surmised, but to stresses, and to obviate this difficulty means were devised for tightening up the plates in the moulds in proportion to the liquid eutectic expelled.

In Fig. 1, which represents one of the devices, is a hollow shaft, traversed by a rod which is provided with a thread at the end. By turning the handwheel, which has a female thread engaging with the thread on a pin on the rod—projecting through a slot in the hollow shaft—is made to operate a bell-crank level. This, in turn, displaces a rod which acts on other bell-crank levers and transmits pressure to the mould in which the plate is held.

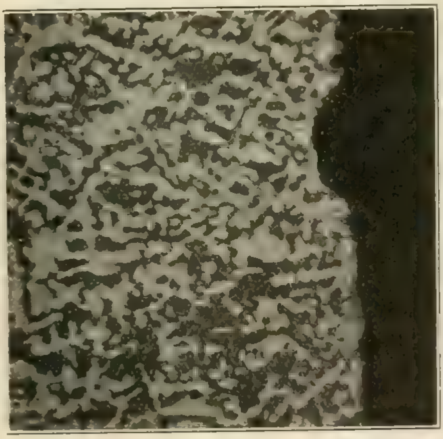


**Fig. 2. Photomicrograph of a Porous Lead and Antimony Plate.**

### *Accumulator-Plate Experiment.*

Experiments with accumulator plates made in the above-described manner have been carried out at the central engineering shops of the Danish State railways. The plates are of the Planté, or unfilled type, and therefore present an extensive surface of lead with a very thin facing of active material. So far as the trials go, these plates will stand increased amperage better than plates of the Faure type—an important point in connection with motor car and submarine work.

Up to the present no attempt has been made to use these porous metals for other purposes, though a number of applications suggest themselves, such as porous metal filter plates, bearing metal lubricating through the pores, to prevent back-firing in pipes conveying explosive gases, as catalysers, and for impregnating porous rods of tin with rosin, for soldering purposes. Again, if silver be deposited electrically in porous lead plates, and the lead be then removed by melting and centrifugalising, porous silver plates are obtained, and these could be decorated with various colored enamels to produce a cloisonné effect.

The porosity of the plates obtained by the author's method can be varied according to the composition of the alloy taken, the heating temperature, and the rate of centrifugalising. It may seem a roundabout way to cast the metal into a plate and then reheat it to the melting point of the eutectic, instead of centrifugalising the plate during the cooling stage, but with the latter procedure the molten metal when poured into the mould has a tendency to run through the wire gauze.

*Dimensions of Pores*

Photomicrographs of a number of these porous plates have been prepared by Professor H. le Chatelier, and one of these (lead) is shown in Fig. 2. The dimensions of the pores and their permeability to liquids, as well as the resistance of the porous plates to tension and compression, have not yet been determined. It is, however, certain that the water absorbed in the plates can be driven out again by placing the mouth against one side of the plate and blowing; and it is also known that plates can be prepared in which more than one-half of the total space is occupied by the pores. Assuming the number of pores to average 20 per square millimetre (as has been found by microscopical examination) and to be of circular cross section, perpendicular to the plate, and occupying 50 per cent. of its total bulk, the total surface presented by the pores will be about 130 times the natural superficial area of the plate, taking the dimensions of the latter as 5½ by 3¼ by ¼ in. In comparision it may be mentioned that perforating leaden accumulator plates and providing them with gills only increases the natural surface about eight-fold.—*The Ironmonger.*

## The Presence of Oxygen in Brass Condenser Tubing.

At the Ghent meeting of the *British Institute of Metals* on Aug. 28th., T. West of Manchester, England read a paper on the "Determination of Oxygen in Copper and Brass" and which is devoted mainly to the methods employed in the determination of the oxygen. He found that the most accurate method is to heat the copper or brass, in a finely divided condition, in a stream of carbon monoxide gas. The oxygen combines with the gas, forming carbon dioxide gas, which can easily be weighed by absorption in a potash solution. In connection with the experiments, however, the following comments were made upon the quantity of oxygen found in brass and the method as applied to alloys containing tin and also to German-silver. The brass used was composed, the author states, of from 60 to 70 per cent of copper and the remainder of zinc.

"This and similar results from other experiments prove that ordinary brasses of good quality contain on an average about 0.002 to 0.003 per cent of oxygen, which is evenly distributed throughout the mass of metal, most probably in the form of very minute particles of oxide of zinc. When it is remembered that the specific gravity of metallic oxides is much less than that of the metal, it is easily understood that even this amount of oxygen in the form of oxide will occupy a greater bulk than is at first apparent. If any sample of brass gives, on reduction in carbon monoxide as previously described, a much higher figure than 0.003 per cent. of oxygen, then it is most probable that that particular portion contained an unusually large piece of zinc oxide or other oxide impurity which had become entangled during the casting. Further, the analysis of a specimen from one sample of brass may disclose a higher percentage of oxygen than another, and yet the latter may be found to corrode more rapidly than the former. This may be explained by the fact that the one will corrode more rapidly which contains the segregated pieces of oxides, as a greater difference in potential will be set up and the rate of corrosion will be more intense.

Some further tests were carried out with condenser-tube brass containing about 2 per cent. of tin and German silver. In these cases, however, a rather surprising result was obtained, as a deposit of carbon was found adhering to the metallic surface after cooling down in an atmosphere of carbon monoxide. With the brasses, this deposit was quite small, but the percentage of oxygen was on the average about 0.006 per cent. In the case of German silver, however, the deposit of carbon was quite a heavy one, and if the alloy were mixed with a small amount of tin the deposit was heavier still, while the oxygen percentage varied so much that it was evident there was decomposition of carbon monoxide occurring. Some zinc was melted alone in a current of carbon monoxide, as was also some tin, but in neither case did any decomposition of carbon occur. When, however, a mixture of tin and zinc was melted in the gas there was a deposition of carbon.

It would appear therefore from these experiments that while the percentage of oxygen in condenser tube brass containing only copper and zinc can be determined satisfactorily by ignition under carefully defined conditions in carbon monoxide, this method cannot be applied to the case of copper and zinc alloys containing tin or nickel, owing to the decomposition of the carbon monoxide which is thereby caused."

## A New Aluminum, Nickel and Magnesium Alloy.

A new alloy of aluminum, nickel and magnesium has recently been proposed by A. L. Brooke and R. D Mackintosh of Mortlake, England. The alloy is produced by the reduction of the oxides, instead of from the component metals and the following method is used:

Aluminum is melted in a lined crucible and oxide of nickel is added after which it is heated to 1600° C. to promote the reduction to metallic nickel. When this has been done, metallic magnesium is introduced. The amount of nickel thus introduced into the alloy is, of course, uncertain, but from the amount of the oxide used, it would probably be approximately the following:

| | |
|---|---|
| Aluminum | 90 % |
| Nickel | 9% |
| Magnesium | 1% |

The proportions, however, are greatly varied to suit different cases. The method of making the alloy has been patented.

## Brown Color on Bronze Castings.

Brass founders frequently desire to color a bronze casting a brown color so that it will have an ornamental and commercial appearance. The ordinary bronze color will not answer the purpose. They may desire to place an article, such as a bronze tablet on the market, or to manufacture them for the trade They must then be colored

While there are various formulas for coloring bronze, many of which require considerable skill to produce and are more or less complicated, it should be borne in mind that bronze can be colored a brown color of a pleasing appearance by means of liver of sulphur. While this substance colors copper black, it gives a brown on bronze or composition castings. The color is quite satisfactory and is very easily applied.

Bronze Article Finished with Brown Bronze.

To color the bronze make up the following solution:

| | |
|---|---|
| Water | 1 gallon |
| Liver of Sulphur | 1 oz. |

Use cold. A stone crock or iron kettle may be used. In case a large quantity is to be used, a wood tank can be employed.

The casting to be treated or colored is first cleaned from any grease or oil and it should be borne in mind that this is quite necessary as the coloring will not take place on a greasy surface. The surface may be treated with benzine, if very greasy and the main portion of it removed. Then scour with pumice and water to obtain the final clean surface, rinse and the surface is ready for coloring. Dipping in a mixture of equal parts of sulphuric and nitric acids may be used for cleaning, but scouring is preferable as it leaves a better surface.

When clean, immerse the casting in the liver of sulphur solution and allow to remain for 10 minutes when it will be found that it has a color that is variegated and not very pleasing. This color is more of a slate color. Now remove from the solution, rinse well in cold water and dry. Be sure the casting is dry before the final treatment.

The next operation is to scratch-brush the dry surface with a brass-scratch brush, either a round one run on a polishing lathe or a hand brush. The hand brush, however, will be found very satisfactory as there is little labor required.

The result obtained will be an excellent brown-bronze color and one very easily obtained by any one. It will answer for the average brown finish on cast bronze work. Were the article of copper a black finish would be obtained, and on yellow brass nothing but an uneven stain will be produced, but on bronze, a brown color will be produced and there seems to be no danger of obtaining anything else for a prolonged immersion in the liver of sulphur solution will not produce a deeper color than the brown finish.

## A New Solution for the Electrolytic Refining of Copper.

A new solution for the electrolytic refining of copper has been patented by George D. Van Arsdale of East Orange, N. J. It is claimed to be superior to the ordinary solution of sulphate of copper for the reason that a very much less quantity of current is consumed. The principle lies in the use of a solution of cuprous sulphate instead of the cupric sulphate (blue-vitriol) ordinarily employed.

The solution may be produced by reducing the cupric sulphate (ordinary copper sulphate) by any suitable reducing agent, but a good method is stated to make the solution ammoniacal and then pass sulphur dioxide gas through it. It is stated that the current consumption is reduced one-half.

## A New White Metal Alloy.

A new white metal alloy has been patented by John Coup of Marion, Ohio for which much is claimed. The inventor says that it can be used as a substitute for nickel plated articles and also for the manufacture of piano-strings, bells, etc., in which it is necessary that a non-corrosive property shall be possessed in order that the tone be maintained. The white-metal alloy is composed of the following:

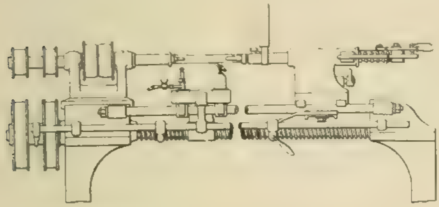
| | |
|---|---|
| Copper ............. | 69.13 parts |
| Nickel .............. | 14.81 parts |
| Zinc ................. | 8.64 parts |
| Aluminum | 3.70 parts |
| Phosphor-Tin ...... | 3.08 parts |
| Lead . . . . | .58 parts |
| Iron ................ | .08 parts |

It will be noticed that the alloy is practically a German-silver containing aluminum and phosphor-tin. It is stated that the cast metal has from 70,000 to 90,000 lbs. per sq. in. tensile-strength. The inventor states that the phosphor-tin should be added after the zinc has been introduced and that it "destroys all the corrosive acids in the copper zinc and nickel". This is quite an amusing metallurgical fact (?). The following comments are also made upon the uses of this wonderful alloy:

"The metal alloy produced in the manner previously described is adapted for general commercial use. In using the same in the manufacture of cast articles, dry sand is used in the mold and while the metal is being poured, all windows, doors and other openings are closed to prevent drafts and thereby obviate oxidizing of the metal which should be poured quickly while at a "white" heat. Phosphor-tin constitutes the base of my new metal, but when the compound is used for the manufacture of knives or other articles which are stamped or cut out, the quantity of tin is increased and the quantity of phosphorus is decreased. Conversely, in the use of the compound for the manufacture of articles which require rolling, the tin is greatly reduced and in some instances altogether omitted. The use of the phosphor-tin results in the production of a metal alloy which is malleable while at the same time being extremely strong and durable. The product which is produced by combining the several mineral ingredients in the manner above described is absolutely non-corrosive and may be rolled into sheets and drawn. The metal may be used in the manufacture of various articles of cutlery, harness trimming, automobile trimmings, soda fountains, as a metal packing, and for many other uses."

## A Machine for Spray Lacquering Brass Bedstead Tubing.

The ordinary method of lacquering brass bedstead tubing is by means of a brush manipulated by hand. The tube is heated to allow several coats to be applied rapidly. In a patent recent granted to Robert L. Horrel of La Garenne-Colombe, France (U. S. Patent 1,070035, Aug. 12, 1913) the tubing is lacquered on a machine. This machine is herewith illustrated.



Machine for Lacquering the Tubing.

The tubing is held on a lathe with a specially designed tailstock for clamping it in and holding it. The tube is revolved in the same manner that any work would be rotated on a lathe. One speed only is required.

Underneath the tubing on a slide rest is situated a Bunsen-burner which is supplied with gas by a rubber tube. This is used to heat the tube, and as the tube revolves the Bunsen-burner moves along from one end to the other. On the other side of the slide rest a spraying apparatus is situated and this is operated by compressed air in the usual manner. After the tube revolves and is heated by the Bunsen-burner, it is lacquered by the spray.

The tube is first heated, while revolving, and the slide rest or carriage holding the burner passes from one end to the other. The heat is then cut off and the spray started, and at the same time the rest or carriage containing the spraying apparatus is reversed and the lacquering of the tube takes place during the return of the carriage or rest to its original position.

## A New Device for Tilting Carboys.

The pouring of acids out of the ordinary carboy is not only a difficult but also a dangerous operation. The danger increases when the carboy is partially empty and many bad burns have been imparted to mill operatives who have had, as their duty, the emptying of a carboy.

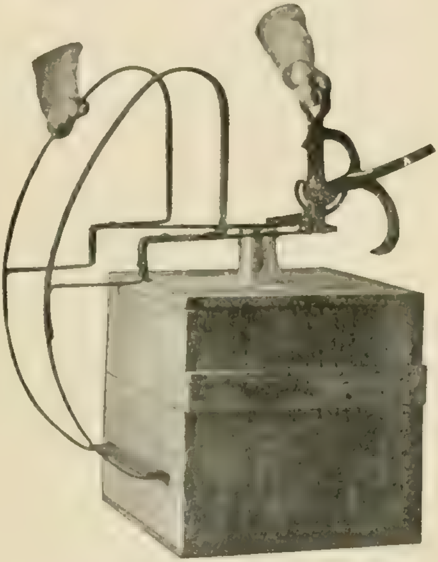


Fig. 1. Clamping the Device on the Carboy.

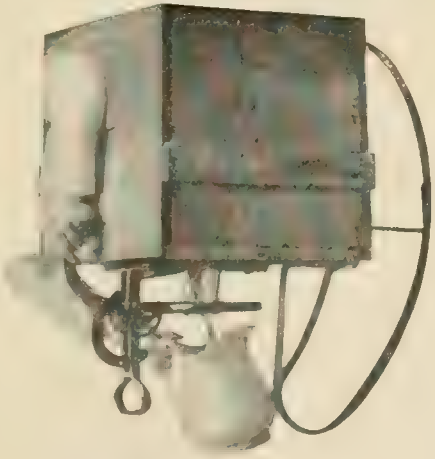


Fig. 2. Tilting the Carboy Entirely Over.

A new device for tilting carboys has recently made its appearance on the market and which is herewith illustrated. The device is called the "Carboy Inclinator" and is made of metal. In Fig. 1 is shown the inclinator and manner of fastening it in position. It is simply clamped upon the carboy. In Fig. 2 is shown the manner of pouring the last portion of the acid from the carboy and the manner of tilting it. One man operates the device and does it quite easily, without the danger which always acompanies the pouring in the ordinary way, and in addition there is no waste of acid.

The device has been patented and is manufactured by the Carboy Inclinator Company, 1269 Broadway, New York City.

## The Wonders of Nitro-Cellulose.

In the September issue of the *Dupont Magazine*, an article on the remarkable features of nitro-cellulose is published. This publication is issued by the E. I. du Pont de Nemours Powder Co. of Wilmington, Del. The article is as follows:

"Cellulose is the commonest of common things. More than a third of all the vegetable and animal matter of the world, when dried, is cellulose.

Cellulose is the structural basis of all plants, the chief substance of thin microscopic cell walls.

The principal commercial sources of cellulose are wood pulp and cotton.

The wood pulp is used chiefly in paper manufacture, and while cotton cellulose, not nitrated, is used in various industries, it is also the principal basis of nitro-cellulose—the subject of this story.

Cotton treated with nitric acid becomes nitro-cellulose or gun-cotton, one of the most important high explosives known.

In the gun-cotton state it is used chiefly for charging torpedoes and submarine mines.

When mixed with nitroglycerine, the jelly-like compound is blasting gelatine or smokeless powder.

Blasting gelatin is an explosive equal in power to liquid nitro-glycerin, but safely transportable by rail or otherwise. It is invaluable for submarine or tunnel blasting, as it is waterproof, fumeless and very effective in hard rock · Its plastic condition makes it easy to load.

Smokeless powder is similar to blasting gelatin but contains less nitro-glycerin, sometimes more. When first made it is jelly-like and while in this condition it is pressed into round bricks or "wires". Both gun-cotton and smokeless powder have revolutionized warfare, but it is the utility of nitro-cellulose in peaceful rather than in military, pursuits that chiefly concerns us. It seems destined to be one of our greatest constructive materials.

Celluloid, familiar to all, is a solution of nitro-cellulose in camphor and alcohol. It is used in a thousand and one ways for products having an annual value of more than $4,000,000 in the United States alone, and its use is increasing steadily.

Collodion is nitro-cellulose dissolved in ether and alcohol. Liquid court plaster is nearly pure collodion.

Nitro-cellulose is the basis of photographic film, motion-picture film and the coating of photographic plates.

Artificial leather is cloth coated with a sort of collodion. The "dope" used successfully imitates the appearance and "feel" of leather, but has the added advantage of being waterproof and washable. The better grades of artificial leather are really better than all but the best grades of hide leather, except that no artificial leather will stand abrasion, such as shoe-wear, as well as hide leather. Large quantities of artificial silk are made from nitro-cellulose. This vegetable silk is used not only with cocoon silk but all alone in the manufacture of "silk" fabrics.

Five tons of artificial silk are produced daily in Europe and its manufacture in this country is growing.

Nitro-cellulose forms the coating of gas mantles. It is the chief solid in metal and wood lacquers, and in the dope used for putting the patent leather finish on hide or manufactured leathers. It is used for water-proofing straw hats, and for finishing piano cases It is impossible to predict the multitudinous future uses of this versatile substance.

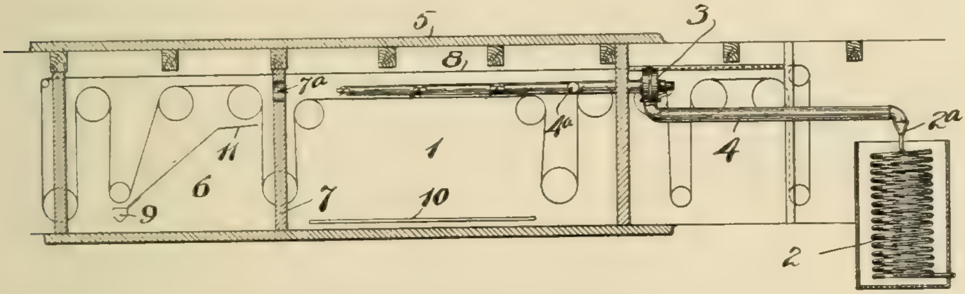
Its chemical history and behavior are shrouded in gloom. Its known utilities have been largely the results of chance discoveries. What can be accomplished when chemists are able to proceed with it along synthetic lines may only be imagined.

No matter what your business may be, the chances are you will soon use nitro-cellulose in some form, if you are not already doing so. Hence it is well to know that in commercial adaptations it is not explosive—nor, except as celluloid, very inflammable.

As the chief American maker of nitrated cotton, the Du Pont Company, through its chemical branch, is interested in any possible use of nitro-cellulose, and will gladly conduct experiments looking to the solution of any manufacturer's problem wherein nitro-cellulose might serve."

## Apparatus for the Recovery of Waste Lacquer, Japan, etc.

In lacquering and japanning metals, a considerable portion of these materials is lost in the form of drips, etc. In the course of a year, such waste means quite a loss to a large consumer of lacquer and japan. An apparatus for the recovery of the waste thus occurring when these materials are applied to metals, has recently been patented by W. S. Rowland of the Stanley Works of New Britain, Conn. The apparatus is herewith illustrated.



Apparatus for Saving Lacquer or Japan.

The inventor described his apparatus in the following manner:

"In the drawing—1 represents what I may term a kiln or drying chamber.

2 is a representation of a condenser of any suitable form.

3 represents a blower, pump or exhauster, or equivalent means, so associated with the kiln and condenser as to operate in a manner to cause the vapors in the kiln to flow to the condenser. In the particular apparatus shown this blower 3 is placed between the kiln chamber 1 and the condenser 2 and located in a suitable conduit.

4a 4a are openings in and near one end of the pipe 4 arranged to receive the vapors, these openings being disposed in any suitable location best adapted for the intended purposes.

2a represents the point where the conduit or pipe 4 is connected with the condenser 2.

As is indicated, the kiln chamber 1 is bounded by a suitable wall 5. In the preferred form of the apparatus I provide another chamber 6 which I will term the dipping chamber wherein the application of the material to the articles to be coated occurs.

7 represents a partition which preferably separates the chambers 1 and 6.

In the particular form of my invention shown herein, 8 represents a belt or chain conveyor upon which the articles to be coated may be placed or hung at some convenient point outside of the apparatus and by which said articles are conveyed first into the dipping chamber 6, where the articles may be lowered into a dipping tank 9, and then passed on over a dipping board 11 into the kiln chamber 1, wherein the articles are dried. Suitable passages trapped in any suitable way are provided in the walls of the chambers to permit the entrance and exit of the goods, and it is preferred that the entrance and exit passages in the outer walls of the chamber should be comparatively tight, while, as will later be seen, this is of no material consequence as to the passages in the partition 7, where the means for accelerating the drying is such as later described.

10 represents one length of a heating coil located in the chamber 1, which serves as one means for accelerating the drying of the goods within the kiln chamber 1 by raising the temperature therein. Obviously, other suitable means may be sustained in place of said heater.

Traps may be located at whatever positions it is desirable to have them, and I have shown in Fig. 2 one of the many forms of traps which may be employed, in which 12 represents the revolving shutter element thereof protecting the entrance passage through the wall 5. Since I lay no claim to any specific trap construction, a further description thereof is needless.

In the process of covering material or manufactured articles with lacquer, japan and other similar coatings, an appropriate solvent or vehicle is employed, which upon evaporation leaves upon the material or articles the desired coating, previously dissolved and rendered fluid by the aforesaid solvent or temporarily thinned by the aforesaid vehicle to facilitate application. In other words, it should be understood that the coating mixture consists broadly of two principal elements, viz., the material which is to be retained upon the article and the vehicle (frequently a solvent) by which said material is temporarily thinned for the purposes of application. The vehicle or solvent is therefore in the majority of cases only a temporary expedient and in such instances is permitted, or made to evaporate. Heretofore, the vapors have become lost and dissipated whereas by my process it is the intention that these vapors shall be recovered and retained whereby great economies are effected. In the apparatus such as shown the wall 5 constitutes as tight an inclosure as possible, and while not necessarily air-tight, it is nevertheless constructed with as few openings as possible to provide for the proper entrance and exit of the articles to be coated, which openings may be suitably gated if desired. The blower 3 preferably provides a means for continuous exhaustion of the kiln chamber, thereby creating a very slightly reduced pressure therein. In this way, any draft through the openings which provide entrance and exits for the goods is in a direction to prevent the escape of vapor or gas caused by evaporation within the chambers or chamber.

From the foregoing it will be seen that when the apparatus is in use, the volatilized or gasified solvent or vehicle is restrained within the aforesaid chambers and is permitted to escape only through the aforesaid pipe 4, which conducts said volatilized or gasified element to the condenser wherein it is transformed to a liquid state, in which latter form it may be retained and preserved for further use. It is apparent that when this process is practised on a substantial scale, great commercial economies heretofore unattained are secured.

It will be understood, of course, that any volatilized or gasified elements contained in the dipping chamber will be drawn off through the pipe 4 and conveyed to the condenser. In this particular instance the partition 7 may have a passage 7a to permit said element to flow from the dipping chamber into the kiln chamber, and thence to conduit openings 4a."

## The Use of Magnesium Sulphate in Nickel Plating Solutions.

Many of the new nickel plating salts, now being sold upon the market, contain magnesium sulphate and platers, as a usual rule, are not familiar with the properties of this substance. The ordinary name for magnesium sulphate is sulphate of magnesia, and a commercial name is Epsom-salts.

Magnesium sulphate is added to a nickel solution to increase the conductivity and, therefore, is what is known as a "conducting salt." It appears to have good properties in this respect and the results which have followed its use in nickel plating solutions would appear to warrant its employment. In addition it is cheap and readily soluble in the solution so that it seems to have considerable in its favor.

The employment of magnesium sulphate in nickel plating solutions is not new and in most of the text books on electroplating its use in this manner can be found. Langbein* has the following comments to make:

"A fairly good nickel bath for electroplaters having but a feeble current at their disposal is obtained from a solution of the following proportions:

| | |
|---|---|
| Water . . . . . | . . . 1 gallon |
| Double Nickel Salts | . 8 oz. |
| Magnesium Sulphate . | . . 4 oz. |

The electromotive force used is 4 volts. The bath deposits with ease and a heavy coating can be obtained on iron without the disagreeable consequences of some of the other nickel plating solutions. Even zinc can be directly nickeled on it with a comparatively feeble current. The deposit, however, turns out rather soft, with a yellowish tinge.

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*Electrodeposition of Metals, page 259.

and the bath does not remain constant, but fails after working at the utmost three or four months, even cast anodes being but little attacked."

The latter statement about the failing of the bath after several months of use should, however, not be taken seriously as the same thing will happen to any nickel solution if not properly looked after. There is no theoretical reason why a solution containing magnesium sulphate as a conducting salt, should change any sooner than one not containing it. Langbein's belief was apparently quite unfounded and was undoubtedly caused by the solution becoming exhausted of nickel, either from too few anodes being used or from not being sufficiently soft to give off their nickel readily.

The fact remains that magnesium sulphate is a good ingredient in a nickel plating solution and tests have proved it so. It apparently has no action other than a conducting salt, but in this respect it has the value of allowing the electrodeposition of the nickel to take place with less current consumption and also an accompanying lower voltage; in addition, as always follows increased conductivity, the nickel deposits more evenly and uniformly.

## Observations on Base Metal Thermocouples used in Pyrometers.

A paper on this subject was read by O. L. Kowalke at the Denver Meeting of the *American Electrochemical Society,* held on Sept. 9th to 11th and embodied the results of some experiments on the subject. He says:

"The thermocouple as a means of measuring temperatures seems to be used by a large variety of industries, if one may judge from the records of sales. It is peculiarly adapted for this purpose because of (1) the small volume the junction occupies, (2) the robust nature of the couple itself as compared to a thermometer, (3) the simplicity of the measuring or indicating instruments, (4) the rapidity with which the measurement can be made. Up to about seven years ago the platinum couple, which had been thoroughly investigated and tried out, was almost alone in the field. Since there have appeared on the market couples made of the baser metals, such as iron, nickel-chromium, nickel, cobalt and other alloys. These couples came into favor because of their cheapness as compared to the platinum couple both as to first cost of the outfit and the cost of renewals of the couple itself, the high electromotive force generated and the use of a robust double-pivoted millivoltmeter. Among the causes for the inaccuracy of the platinum couple were heterogeneity of the wires in the couple and their contamination by metals or gases from the place where the temperatures were to be measured. All but the first of the causes named can be avoided after the couple is made, but the wire must be made homogeneous before the couple is completed.

Since the voltage generated by the couple for a given temperature is the summation of all the electromotive forces due to the contact of two dissimilar metal portions, it can readily be seen that it is imperative that the metal be as homogeneous as possible if the electromotive force indicated be that resulting from the two metals at the hot junction. If, then, the couple is composed of metal which is not homogeneous, then at each junction of two dissimilar metals there will be set up a voltage which is a function of the temperature existing at that point. Should the position of the couple be changed with respect to its depth of immersion, then the resulting voltage will be changed even though the temperature had not changed at all. A couple made of wires which are perfectly homogeneous is apt to be rather expensive, and the only combination which seems to fulfill this condition is the platinum and platinum-rhodium couple.

It is possible to get a couple which is sufficiently homogeneous so that the indications are satisfactory for many commercial purposes where an accuracy of 25 to 50 degrees is wanted. This condition is realized in the combinations of which base metal couples are made. Not all the couples meet this condition with the same accuracy and not all the couples retain their original accuracy. Some couples seem to change or deteriorate with use more than others, due to oxidation, crystallization, segregation of the metal and other undetermined causes."

The conclusions arrived at from the experiments were as follows:

This series of investigations seem to point to the fact that it is possible to obtain a base metal couple which is reasonably homogeneous and will give indications of temperature which are sufficiently constant to meet the needs of perhaps the greatest number of requirements for high temperature measurements in the industries.

There are some instances where the temperature is to be known to an accuracy better than 25°, and for such requirements it would be necessary to use a higher grade of equipment, and, furthermore, for such requirements it will be necessary to make frequent calibrations.

It would seem reasonable that the makers of thermocouples determine from the purchaser the particular conditions under which the couple is to be used and that the calibration of this couple be made for the same length of immersion at which the purchaser is going to use it.

A couple which will indicate an apparent difference of temperature amounting to about 130 degrees C. when immersed at different lengths in the bath or furnace is not giving the service that ought to be rendered.

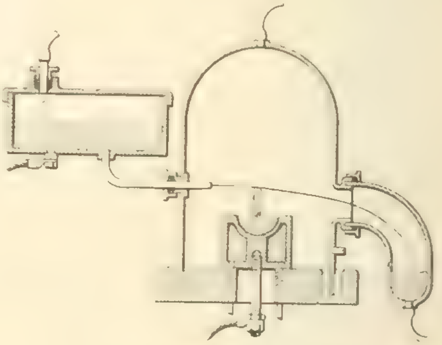
From these tests it appears that not all manufacturers are careful in sending out couples which have been thoroughly annealed to remove all strains resulting from mechanical treatment. Once the couple has attained its permanent structure, there does not seem to be much change in the electromotive force.

## A Novel Electric Furnace.

A novel electric furnace has recently been patented by Ezechiel Weintraub of the General Electric Co., and which utilizes a flowing stream of mercury within arcing range of the material to be melted.

Some of the advantages which may be secured by the use of the improved furnace are as follows: Mercury is inert with respect to many refractory materials, such as boron, silicon, tungsten, titanium, refractory carbids, and the like and hence will not contaminate these materials when used as the opposing electrode. The electrode stream being constantly renewed is self-cooling and hence permits the use of currents of great power. Refractory materials in powdered state may be treated, or melted instead of first having to be pressed into coherent form, or molded with a binder, as is the case in my prior form of furnace. In a furnace as above described impure boron, or boron compounds, such as boron suboxid, may be highly heated and dissociated yielding chemically pure, coherent boron bodies.

The arcing space is inclosed by a hood, or envelop 1, consisting of any suitable material as iron, copper, or glass, and is preferably supplied with a protective gas, such as hydrogen or nitrogen through a tube 2, although in some cases the space may be evacuated. The gas may be carried away if contaminated with chemical by-products through a tube 3. The base 4 may conveniently consist of soapstone, or other suitable insulating material if the hood 1 is metallic, or it may be metallic itself if suitable provision is made to insulate the electrodes from each other. The base may be joined gas tight to the hood by any well-known means such as mercury seal 5. A preferably water-cooled metal container, or electrode 6 serves both to support and carry current to the charge which may be in a powdered or non-coherent state. Suitable current connection 7 is made as indicated. The cooperating electrode is constituted by a stream 8 of vaporized material, preferably mercury, which is inert with respect to the charge. The mercury stream is projected or otherwise passed within arcing distance to the charge from a tube 9, preferably consisting of quartz, or similar non-conducting material, communicating with a reservoir 10 containing a column of mercury. Current connections to the mercury stream may be conveniently made by connection to the reservoir as indicated at 11. The arc may be started by a high potential discharge, or by first causing the stream 8 to come into contact with the other electrode and then increasing the pressure, so as to raise its level and cause it to flow into a receiving chamber 12. This


Weintraub's Electric Furnace.

chamber is preferably made of glass, or has a glass window through which the arc may be observed. The mercury, or other vaporizable material may be returned by any appropriate means through tubes 13 and 14 to the reservoir 10. The stream 8, preferably is made the cathode.

## Heating Metal in the Ladle by Electricity.

A patent has recently been granted to William S. Franklin of South Bethlehem, Pa., for a method of heating metal by electricity while it is in the ladle. This method, the inventor states, is applicable to all metals, even platinum.

Use has been made of the fact that, at a high temperature, the clay lining of a ladle becomes a conductor of electricity, although it is a non-conductor while cold. Making use of this fact, the use of carbon electrodes is avoided.

To utilize the property the ladle is connected with one pole and the metal with other. In order to obviate the passing of the current through so large a body of metal, it is poured from one ladle to the other, as shown in the illustration, and the resistance of the stream utilized.

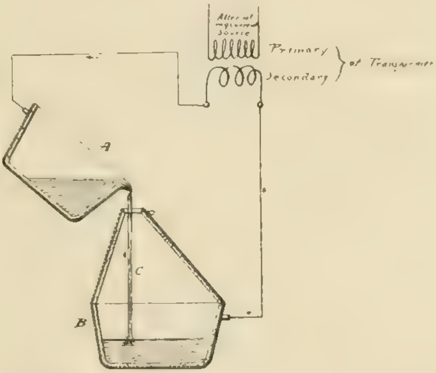
The following uses for the process are given by the inventor:

"1. In ordinary iron foundry work it is sometimes desirable to melt a small charge of chromium or other refractory metal preparatory to its admixture to the cast iron in the large ladle. For this purpose a small amount of melted cast iron or slag may be drawn off into the ladles, heated up to any desired temperature, after which the chromium or other metal may be added and the electric treatment continued, if necessary, before the melt is poured into the main mass of cast iron.

2. It may be used as in the procedure described in the previous paragraph, in conjunction with the Bessemer or open hearth process for making steel. That is, refractory substances may be treated electrically before being added to the steel.

3. For the treatment of platinum or other metals which must be treated at very high temperature in the absence of carbon. In such a case, a suitable slag could be melted in an auxiliary furnace, poured into the jet furnace ladles and brought to any desired temperature. The platinum or other metal to be treated could then be introduced and the electric heating continued *ad libitum*.

4. It can be used on a large scale for the manufacture of high grade steel. For this purpose, it would be best to melt a suitable slag (basic salt for example) in an auxiliary furnace, pour it into the ladles, both made as large as desired. With this slag the jet furnace could be gotten into operation. Then either molten cast iron or cold scrap could be introduced and the heat treatment continued until the desired composition has been reached. Then, instead of discharging the entire melt a portion could be left in the furnace ladles to start the operation anew, and so on.



Heating Metals by Electricity while in the Ladle.

5. My invention can be used for the melting of high grade classes, the operation being once started by a melt from an auxiliary furnace. For glass melting this jet furnace would be particularly suitable, inasmuch as carbon electrodes are absolutely out of the question here, and inasmuch as the glass jet could be drawn out very long (and covered by a protecting hood) and a small current at any desired high voltage could be used.

6. And, in general, my invention can be used for the electric heating of any metallic or vitreous substance."

In silver plating steel knives, much of the difficulty found is caused by the rusting of the steel after cleaning and before plating. No metal will adhere to a rusty surface although it can be plated.

# Questions and Answers.

QUESTION No. 1346. In casting door knob necks on porcelain tops of faucets, we use sulphur and find a great many bad. Now is it possible for us to dissolve the sulphur and pour it in instead of melting it and casting it around the neck? What can be used to dissolve the sulphur?

*Answer.* You will be unable to dissolve the sulphur for the purpose you mention. Carbon bisulphide dissolves sulphur but sparingly, and the solution could not be used for the purpose you mention as it would not set solid. You will have to melt the sulphur.

QUESTION No. 1349. Can manganese-bronze be successfully used for making valves? We have some valves to stand a high pressure and have specifications calling for manganese-bronze. We have been informed that it will not be possible, and before we start would like to have your opinion.

*Answer.* While valves can be cast of manganese-bronze, it cannot be called a commercial success. The difficulty is that you will have considerable loss from leakage. Manganese-bronze contains aluminum and this is the cause of the difficulty in casting. If the valves do not leak, you will find them excellent, but you may have 75 per-cent of bad castings so that, as the number of good castings obtained is a variable quantity, the cost cannot well be figured. A manganese-bronze casting may have an excellent appearance, and still leak under pressure.

QUESTION No. 1350. Will a solution of cyanide in water have any effect in causing roughing or pitting of small brass plates if they are left immersed in it over night?

*Answer.* A cyanide solution acts slowly on brass and will roughen or pit it if left in sufficiently long. The rapidity will depend upon the strength of the solution, its temperature and the length of time of the immersion. A hot, strong solution acts much more rapidly than a weak cold one. We should not think your plates would be pitted by standing over night, but they might be slightly roughened.

QUESTION No. 1351. Will you kindly advise us of a good, tough bell-metal which we desire to use in conjunction with a diaphragm plate for sounding purpose in an electric horn? We are anxious to obtain the proper composition of metal for producing the best results.

*Answer.* A stiff, "springy" sheet metal may be made of the following mixture

| | |
|---|---|
| Copper | 95 lbs |
| Tin | 3 lbs |
| Zinc | 2 lbs |

This will give a bronze metal which will become very stiff and "springy" when rolled into sheet. To obtain the best results this sheet should be as hard rolled as possible so that it will have the maximum stiffness. It will not crystallize while in use.

QUESTION No. 1352. Will you supply us with a good brass solution for use in plating small steel goods by the barrel process?

*Answer.* The following is one of the best solutions for brass plating by the barrel method and is extensively used for this purpose

| | |
|---|---|
| Water | 100 gallons |
| Potassium Cyanide | 80 lbs. |
| Carbonate of Copper | 60 lbs. |
| Carbonate of Zinc | 40 lbs. |
| Carbonate of Soda | 60 lbs. |
| Carbonate of Ammonia | 15 lbs. |
| Bi-Sulphite of Soda | 12 lbs. |

The solution can be used cold or warm, but the best results are obtained when warm. Do not heat so hot that the ammonia will be driven off. A temperature of about 120 degrees is good.

QUESTION No. 1353. We recently had occasion to line our acid tanks with sheet lead and in closing the seams, used common solder. We find that the seams have now opened and the tanks are leaking badly. Is there a special solder made for this purpose and if so, where can it be obtained? We are using a combination of sulphuric and muriatic acids in the tanks.

*Answer.* There is no special solder for this purpose and you will have to "burn" the edges of the sheet lead together by the process known as "lead-burning" which is simply a process for melting them together. This is the only joint that will stand. The difficulty with solder is that, no matter what kind it is, it always contains tin which is dissolved out by the acids. The lead is melted together by means of a hydrogen flame and which is so hot that the seam melts before the remainder of the sheet lead becomes hot enough to fuse. A gas flame cannot be used because the temperature is so low that a large portion of the lead melts around the seam. A oxy-acetylene flame can also be used successfully for burning it. Use a chloride of zinc solution (strong) for a flux in burning the seams together.

QUESTION No. 1354. I would like to know whether cold galvanizing, or what is known as electrogalvanizing, is done directly on steel or iron without first coating with copper or brass? I have not had occasion to do any until now and have been under the impression that it cannot be done direct on the steel or iron.

*Answer.* Cold galvanizing, or electrogalvanizing as it is fore frequently called, can be done directly on the iron or steel and is rarely done in any other way. There is no difficulty experienced in depositing the zinc on the iron or steel direct, and as the process is intended as a cheap one, the elimination of the preliminary process, such as copper plating, renders the operation much less expensive

Question No. 1355. What material can be used for stopping off portions of sheet metal reflectors that we do not desire to plate? These goods are lamp reflectors and are silver plated.

*Answer.* Asphalt paint is the best for this purpose. It can be thinned with turpentine and painted on the parts that are not to be plated. The paint need not be thick and if it shows brown through the surface when dry, it will be all right as it will resist the solution in a satisfactory manner and then dries more rapidly. When the silver plating has been completed, the asphalt can be removed with turpentine or kerosene oil. Asphalt paint is also known as asphalt varnish and can be purchased at any paint store and is quite cheap.

Question No. 1356. In connection with certain refrigerating machinery which we make, we deal with a saturated brine solution. We have been using the so-called Government bronze or 88 parts of copper, 10 parts of tin, and 2 parts of zinc, for making the castings of this machinery. It has occurred to us that for the valves, stuffing boxes, pumps etc., there would be some other mixture that would corrode less. We understand that some of the nickel alloys are good for this purpose. Can you suggest any mixture for these parts? It must pour into sand molds readily and not be too difficult to cast in our foundry.

*Answer.* You will find the nickel alloys which you mention, very difficult to cast in your brass foundry. They will have to be treated like steel. These remarks refer particularly to Monel-metal which is the one that would answer your requirements. Even though you could cast it without difficulty, it would be found that perfect castings would be difficult to obtain. You cannot improve upon the mixture you are using. The problem is identical with a metal to stand sea-water, and among the common metals the 88-10-2 mixture is as good as any. We doubt whether you would find any nickel alloy very superior for this purpose, as it will corrode also.

Question No. 1357. What is the proper chemical name for "red copper compound" and is it of value in copper plating?

*Answer.* The right chemical name for the "red copper compound" is cuprous sulphite and is made by adding bi-sulphite of soda to a strong solution of sulphate of copper while hot. The cuprous sulphite is precipitated as the red compound. It is then filtered out and dried. It is a good materiad in cyanide copper plating, but the same results can be produced by the use of bi-sulphite or sulphite of soda in an ordinary cyanide copper solution. The advantage of the red copper compound lies in the presence of sulphurous acid in it, and this can be obtained from the sulphite of soda just as well.

Question No. 1358. We are anxious to learn just what effect antimony has on soft solder when used in quantities greater than a quarter of one per-cent? If you have any information on the subject should be pleased to have it.

*Answer.* It is generally considered that one or two per-cent does not injure the solder; in fact, nearly all commercial soft solder contains a few per-cent of antimony on account of being made from scrap metals. Frequently five per-cent of antimony is found in commercial soft solder. The antimony will prevent the solder from flowing as freely as desired, but otherwise it seems to have no appreciable influence. Soft solder made from pure and new metals, however, flows readily and is preferable to that containing a small amount of antimony, when it can be used. For the best work, it is to be preferred.

Question No. 1359. Some time ago there appeared in The Brass World an abstract of a patent for a nickel plating solution in which hydrofluoric acid was used in making up the solution. Can you inform me whether this solution is now being used commercially?

*Answer.* We do not believe that solution is being used commercially and has not reached further than the patent itself. We are unable to give you any information upon the solution as we have never tried it out.

Question No. 1360. Kindly let me know whether there is any process to tin bronze castings used for bearings, without machining them. The castings are tinned previously to lead lining.

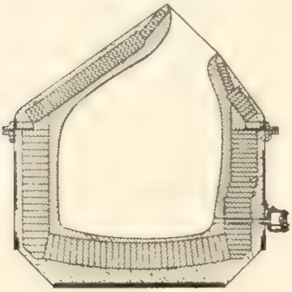
*Answer.* In order to tin the castings you will have to clean the surface and the best method is to machine the bearings, but you can probably clean the surface sufficiently with a sand blast to admit tinning.

Question No. 1361. I am having difficulty with the stove trimmings which I am nickel plating. I am using double and single salts with 2 oz. of boracic acid per gallon and the solution stands at 10 degrees Beaumé. The dynamo gives 6 volts, when it was new but do not think it gives this amount now. The complaint is that there is not body enough to the nickel deposit and that the castings tarnish after a very short exposure.

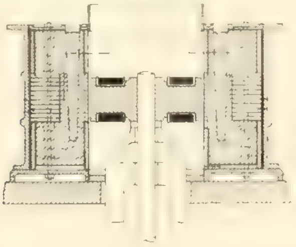
*Answer.* We are unable to say just what your difficulty is as your solution is strong enough to give a heavy deposit, provided, of course, you are obtaining sufficient current. It may be possible your dynamo is weak, and in which case you will not be obtaining a sufficiently heavy deposit to stand buffing. If this is the reason then you are buffing off the nickel, leaving the bare iron in places which will, of course, tarnish. The way to ascertain this is to copper plate a casting previous to nickel plating it, and then nickel plate. If you are buffing off the nickel it will show the copper. Your solution is pretty strong. Better results are obtained when the solution stands from 6 to 7 degrees. Add about 2 oz. of sal-ammoniac to each gallon of solution and it will increase the conductivity so that you will obtain a heavier deposit with the same current in the same time.

## Patent Abstracts.

1,068,470, July 29, 1913. PROCESS OF FORMING FURNACE LININGS. Archer E. Wheeler and Milo W. Krejci of Great Falls, Montana. The process consists of forming a furnace lining for copper converters or similar appliances in which metal is melted. A molten charge of metal is introduced into the furnace, diffusing oxygen through the charge and thereby segregating therefrom a free oxidized compound which adheres to the furnace walls and forms a lining.

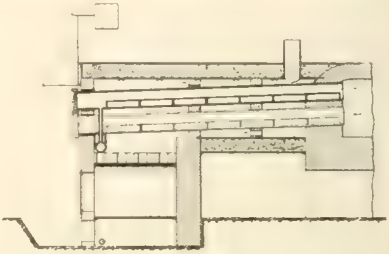


1,068,558, July 29, 1913. ELECTRIC FURNACE. Jean Bally of Grenoble, France. The invention relates to an electric induction furnace wherein the available energy is directly transformed into induced currents by means of a stationary armature. This is formed by means of the metal in the furnace and field magnet and conductor. It is claimed that this type of construction imparts special advantages to the furnace not embodied in any other previous type.

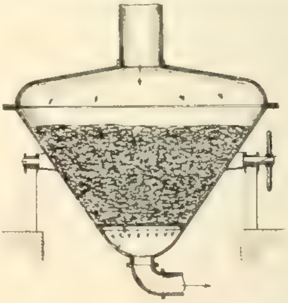


1,069,981, Aug. 12, 1913. METHOD OF RECOVERING COPPER FROM ITS ORES. Edward Schaaf of St. Marys, Missouri, and Stephen D. Martin of Chicago, Ill. Ordinary air is passed through a flaming electric arc and is converted into air containing some of the oxides of nitrogen. It is claimed that this gas, containing these oxides is capable of precipitating copper from its solutions.

1,069,260, Aug. 5, 1913. METALLURGICAL APPARATUS. Woolsey McA. Johnson, Hartford, Conn. An apparatus for use in the smelting of zinc ore and which will efficiently condense the zinc vapors. This is accomplished by means of a carefully controlled temperature in a continuous manner and gas or electricity may be used for heating the ore. The special appliances used may be understood from a perusal of the complete specification.

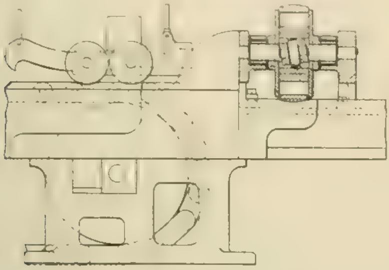


1,069,085, July 29, 1913. PROCESS OF RECOVERING ZINC AND OTHER VOLATILE METALS. Thomas Huntington of London, England and Ferdinand Heberlein of Frankfort-on-the-Main, Germany. A process of smelting zinc ore in a blast furnace. This is accomplished by a special form of furnace shown in the illustration and by the method of charging the ore and fuel in the furnace. It has not been found possible, heretofore, to smelt zinc ore in a blast furnace.



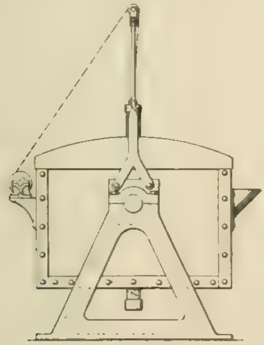
1,068,915, July 29, 1913. APPARATUS FOR APPLYING BRONZE ETC., TO ARTICLES. Jacob L. Moore and Oscar J. McKee of Butler, Pa. Assignors to the Bradle & Vrooman Compan of Chicago, Ill. An apparatus for applying bronze powder to an article, such as a bedstead. The essential feature of the appliance lies in the use of a closed chamber in which the bronzing is done by means of an air blast.

1,068,549, July 29, 1913. MEANS FOR LOOSENING THE TUBE FROM THE MANDREL IN THE MANUFACTURE OF TUBES. Karl Robert Westin of Sandviken, Sweden. In the manufacture of seamless tubes it is necessary to roll or draw the tube shell over a steel mandrel and which is frequently difficult to remove. According to this invention, rollers in a rotating disk roll the tube crosswise, while in the mandrel, thus enlarging it and rendering it easy to remove it.

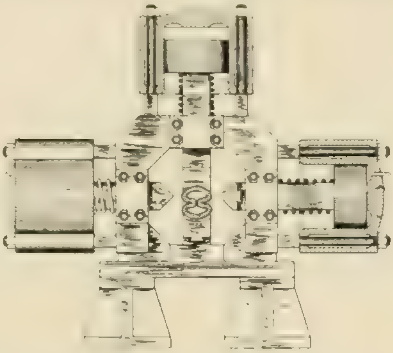


1,070,337, Aug. 12, 1913. ELECTRIC FURNACE. Albert Edwards Greeene of Chicago, Ill. Assignor to the American Electric Smelting & Engineering Company of St. Louis, Mo. An electric furnace of the arc type, the essential feature of which consists in the means employed for generating the arc in close proximity to the metal. A gas is also used in conjunction with it.

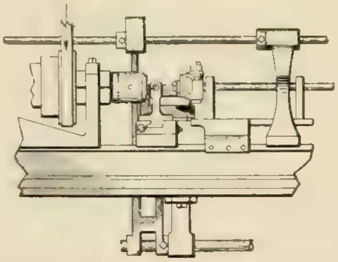
1,070,568, Aug. 19, 1913. METHOD OF MELTING METALS AND ALLOYS. Raymond S. Wile of Pittsburgh, Pa. A method of melting metals or alloys by means of the special electric furnace previously invented by the patentee. The process consists of melting a layer of glass in the furnace by means of carbona electrodes, and then charging the metal on its surface. The metal immediately melts and sinks down below the glass where it is protected from oxidation. It is then tapped off when desired.



1,070,379, Aug. 12, 1913. TUBE POINTING MACHINE. David L. Summey of Waterbury, Conn. Assignor to the Chase Rolling Mill Company of the same city. A machine is pointing tubes for the purpose of holding them while being drawn in a draw bench. Heretofore it has been customary to use a power hammer for this purpose. In the present invention the end of the tube is pointed by a hydraulic press which forces the walls of the tube from four sides and gives it an hour glass section.



1,069,319, Aug. 5, 1913. METAL TURNING MACHINE. William E. Cole of Worcester, Mass. Assignor to the Boston Pressed Metal Company of the same city. A machine for turning sheet metal work of a hollow nature such as cups drawn from sheet metal. The machine is intended for rendering it easy to place such an article in the chuck for holding it while a tool is forced against the edge or other portion of the surface.



1,070,195, Aug. 12, 1913. WIRE STRAIGHTENING AND CUTTING-OFF MACHINE. Franklin B. Shuster (deceased) of New Haven, Conn. A wire straightening and cutting-off machine which is designed particularly for the treating of large diameter wire.

1,069,597, Aug. 5, 1913. MOLDING MACHINE. Wyatt Bond of Chicago, Ill. A molding machine in which the sand is picked up and rotated in an orbit and then projected violently into the mold.

# Trade Items.

A new plant has been established by the R S. Perfection Plating Company at 117 Dodge St., Janesville, Wis. This new plant has given them much larger quarters. The proprietors of the company are T. W. Richards and J. W. Snyder.

The Franklin Silver Plate Company of Greenfield, Mass., who have heretofore manufactured nothing but silver plated cutlery, have now started in the manufacture of high grade flat-ware and are making it from one of the best grades of German-silver base.

The Anderson Tool Company, manufacturers of self-measuring oil tanks, computing scales etc., has been taken over by a new company called the Hamilton Scale and Tank Company which has been organized in Hamilton, Ohio, for this purpose. The capital stock is $250,000.

T. J. Nicholson, 326 Wilson Bldg., Dallas, Texas, has patented a corset stay and states that he expects to start a concern for manufacturing it. He is interested in electrogalvanizing equipment and also in machinery for making the stay. Later he will need someone to take charge of the plating plant which will be started.

The Benedict-Proctor Company of Toledo, Canada, manufacturers of art metal wares, have enlarged their factory by the purchase of the plant of the Defries-Woodman Company of Alliston, Ont., Canada and will move to this place. It is reported that the price paid was $40,000. The Benedict-Proctor Company was started some time ago as a Canadian branch of the Benedict Mfg. Company of East Syracuse, N. Y.

The Ayer Mfg. Co., of New Haven, Conn., manufacture a full line of polishing and buffing compositions and are making these goods to satisfy the user and not merely for selling purpose. They feel sure a trial will convince a consumer of the merits of the goods and they solicit the opportunity to send a *free* sample of any of the compositions which they make so that it can be tested. C. S. Mersick & Company, 278 State St., New Haven, Conn., are the selling agents and to whom all inquiries should be addressed.

The Annual Convention of the American Institute of Metals, the American Foundrymen's Association and the Foundry and Machine Exhibition Company, will be held in Chicago on October 10th to 17th. It is expected that the facilities for exhibiting will be far superior to any yet had. The Headquarters for the Foundry and Machine Exhibit will be at the Hotel Sherman. No tickets for gift distribution will be given out to exhibitors and it is expected that this method will keep the usual mob of curiosity seekers away. Exhibitors will be admitted free, but all others will be required to pay 25 cents for each admission or $1.00 for the entire week.

Attention is called to the "Reliance Canvas Wheels" made by the Charles F. L'Hommedieu & Sons Co., 26-30 South Clinton St., Chicago, Ill. These wheels are of their own manufacture and can be supplied hard, medium or soft. New canvas is used entirely in their manufacture and they will not split open.

The Neubeck Electroplating Co. Inc., announce the opening of their plant at 150 Ellicott St., Buffalo, N. Y., in which electroplating of every description is to be carried on. They announce that Dr. Friederich Neubeck's celebrated plating preparations are used exclusively on all the work. They solicit inquiries for estimates on the work.

The regular monthly meeting of the New York branch of the American Electroplaters' Society was held at their rooms at No. 309 West 23rd. St., New York City on August 22nd. Thirty-five members were present and various important topics were discussed. Through unforeseen circumstances the annual outing and shore dinner was abandoned for this year.

The Aluminum Flake Company of Akron, Ohio, are producing a material called "aluminum flake" for which they are desirous of finding new uses. This material is a mineral product, very finely divided and quite cheap. At the present time it is used in the manufacture of all lines of rubber goods from tire to sheeting, in the manufacture of emery wheels as a bond, in paints, varnishes and the manufacture of chrome leather. It is likewise used as a filler for printing inks.

It is reported that the Government has decided to make further improvements in the United States Assay Office on Wall St., New York City and will tear down the front so long considered one of the finest pieces of architecture in New York City. It was at first hoped that this could be preserved, but it has been found impossible and a new front will be built to allow for the further improvements in the interior. The main interior of the building was recently altered and rebuilt and new equipment was installed in it.

Attention is directed to the fact that R. F. Lang, 8 to 10 Bridge St., New York City is placing on the market a large line of entirely new products for the electroplating and brass foundry trades. The "Royal" prepared nickel salts are made in three kinds for regular work, barrel plating and cutlery. He is also importing specially prepared salts for copper and brass plating, and also a new black nickel salt. The "Royal Verelfa" soap for galvanizers eczema is entirely new in this country. The regular line of phosphor-copper, manganese-copper, silicon-copper, phosphor-tin and the hard solder for cast-iron called "Ferrool-Hocksit", are, as they have been in the past, standard goods with Mr. Lang.

The J. K. Stewart Mfg. Co., Wells St. Bridge, Chicago, Ill., are now turning out die-molded white-bronze castings for the trade which are made by the "Stewart Vacuum Process." This is a new process invented by J. K. Stewart for the manufacture of die castings.

The Polishing & Plating Works has been organized at 58 Golden Hill Street, Bridgeport, Conn., for the purpose of carrying on polishing and plating of all kinds and a specialty will be made of nickel plating. Edward E. Andrew is the manager of the company.

The White-Keegan Company has been incorporated in Providence, R. I., with a capital stock of $5,000 to take over the plant formerly conducted by Zare White, 754 Eddy St., manufacturer of jewelry, and who was the first to manufacture celluloid combs in that city. The same line of goods will be manufactured by the new company.

The Goldschmidt Thermit Co., 90 West St., New York City are sending out a pamphlet which describes the methods of analysis of the various new alloys now used in the steel and non-ferrous metal business. This pamphlet is a translation from the German and in it is given the method of analyzing ferrochromium, ferrotungsten, and other alloys of the rare metals with iron, and also manganese-copper, manganese, tungsten alloys etc.

The University of Tennessee have recently published a useful little book called "Tables and Other Data for Engineers and Business Men." This book has been compiled by Prof. Charles E. Ferris of the Department of Mechanical Engineering and is published by the University Press, Knoxville, Tenn. The price of the book is fifty cents. It contains a large amount of information from areas of circles to methods of treating accidents to mill operatives.

The U. S. Reduction Company of Chicago, Ill., are erecting a building at their works in East Chicago, Ind., to be exclusively used for a white metal department. It will be used for the manufacture of solders, babbitt-metals etc. The latest appliances for the manufacture of these alloys has been installed. The new factory is 32 x 120 feet. A new warehouse, for receiving incoming shipments, is also to be built and which will be 32 x 175 feet. Both buildings will be situated on the private railway sidings of the company.

The Metal Treating & Equipment Company of New York City, which was recently organized to exploit a new electrogalvanizing process, have opened a new plant at 834 Humboldt St., Brooklyn, N. Y., where electrogalvanizing will be done by their new process. It is expected that this new plant will be opened for business about the middle of September. Electrogalvanizing will be done by what they called their "Standard Process." The New York City and main office is at 1784 Broadway in the United States Rubber Building.

The Hot Point Electric Heating Company of Toronto, Ont., has completed plans for a new factory in that city. It is reported that some $250,000 will be expended.

C. C. Penfold of Buffalo, N. Y., manufacturer of bronze tablet work, has moved his factory to 700 Main St., in that city. It is stated that about the first of the year, he will incorporate a new company and enlarge his plant.

A new company, organized by M. L. Grove of Tylersburg, Pa., will build a plant for the manufacture of gas regulators and gas fittings. Brass will be used in the manufacture of these fittings. The plant will be 50 x 200 feet and a company is to be capitalized at $50,000.

The E. H. H. Smith Silver Co., of Bridgeport, Conn., manufacturers of plated and sterling-silver goods, have gone into the hands of a receiver who is now conducting the plant. It is unknown just what disposition will be made of the business, but indications are that the business will be reorganized and continued.

Adolph Neubeck, Inc., the well-known importer of the "Prometheus" nickel plating salts, has moved his office from 126 Fifth Ave., New York City to 150-154 Ellicott St., Buffalo, N. Y., where he will be able to take care of his business in the best possible manner. He reports rapidly increasing sales of the "Prometheus" salts.

The Haas Mfg. Co. Inc., are manufacturers, importers and exporters of polishing materials and electroplaters' supplies of all descriptions and install complete equipment of the most improved type for polishing and plating. Correspondence is invited. Their office is in the Marbridge Building, 34th. St. and Broadway, New York City and the works are at Glenwood, L. I., N. Y. H. M. Bronner is the president and H. L. Haas is the secretary and treasurer.

On August 16th, a meeting was held by the electroplaters in Buffalo, Niagara Falls and vicinity for the purpose of forming a local branch of the American Electroplaters' Society of the United States and Canada. Addresses were made by Mr. Reeves of the Oneida Community of Niagara Falls. Mr. Guelcher of the Pierce-Arrow Motor Car Company and Mr. Leffell of the Spirella Corset Co., of Niagara Falls. Mr. Leffell was made temporary chairman and a further meeting is to be held to effect the full organization.

The New Era Lustre Company, lacquer manufacturers, announce that their new plant at Passaic, N. J., is now in full operation and that they are producing even a better product than ever before. All business is now transacted from their New York office at 92 William St. Franklin S. Cobb is the president and general manager of the company. Since the new factory of the company has been built at Passaic, N. J., and the New York office has been opened, the former office at New Haven has been discontinued.

The Electric Furnace Company of Alliance, Ohio, have increased their capital stock from $100,000 to $200,000.

A one story addition to the plant of the Jones Hollowware Compan of Baltimore, Md. This addition is to be 40 x 160 feet and will be at their foundry plant on Montford Ave. and Chase Sts.

It is stated that the Aeolian Company of Meriden, Conn., is considering the removal of their plant to some other city on account of labor difficulties. The manufacture of piano players is carried on.

The Pratt & Cady Company of Hartford, Conn., manufacturers of valves, and which has been in the hands of a receiver for some time, has been sold to Bishop White of West Hartford, Conn., who will assume all liabilities.

The Kouyoumjuan Electric Mfg. Co., of Cleveland, Ohio, manufacturers of electric generators and other electrical goods, have taken extra space in the building which they occupy on Ashland Road to give them the room they need for the increase in their business.

The business of the E. C. Bliss Mfg. Co., of Providence, R. I., manufacturers of jewelry, is to be merged with that of the A. H. Bliss Company of North Attleboro, Mass., and will be moved to North Attleboro, Mass., for that purpose. A reorganization of both companies has been effected for this purpose.

The Newfield Silver Company of Bridgeport, Conn., have purchased the plant of the Macfarlane Bros. Company at Dewey and Ash Sts., this city and will move their business from 388 John St., to the new plant. The manufacture of automobile lamps and a job plating business have been carried on in the past, but it is expected that a more extensive line of work will be made in the future.

The Pope Mfg. Co., of Hartford, Conn., manufacturers of automobiles and motorcycles, have decided to sell their plant known as the West Works and which has been used for the assembling of trucks. This is the old Pope Tube Works which was used years ago for the manufacture of seamless steel tubing for bicycle work, but which has not been used for this purpose for many years since the sale of the business to the Shelby Steel Tubing Company.

The Lumen Bearing Company of Buffalo, N. Y., is making an addition to their plant which amounts to about 15,000 sq. feet of space. This will include accommodation for the general stores, fuel, sand and cleaning and shipping room. The railroad sidings are also being re-located, and the present industrial trolley system is being extended. The babbitt department and experimental department are to be located on the second floor of the new building. The new addition will increase the capacity of the plant about twenty per-cent. The babbitt department will be able to increase its output about forty per-cent.

The United States Steel Furniture Company, South West St., Syracuse, N. Y., have let a contract for an addition to their plant.

The business of J. L. Garvin & Co., 9 Calender St., Providence, R. I., manufacturers of jewelry, has been sold to the Burns Bros. Mfg. Co.

An addition, 45 x 80 feet, is to be made to the plant of the American Silver Company of Bristol, Conn., manufacturers of silver plated flat-ware.

The plant of the Nassau Lighter Co. of Newark, N. J., manufacturers of metal cigar lighters, has been sold and the company has retired from business.

I. N. Deitsch, Inc., 20 West 32nd. St., New York City, manufacturer of silver novelties, has gone into the hands of a receiver and the Court has appointed Samuel Strassburger to this position.

The St. Louis Screw Company of St. Louis, Mo., manufacturers of screws and similar products, have increased their capital stock from $200,000 to $600,000, to provide for extensive additions to their plant.

The Zenith Carburetor Company of Detroit, Mich., manufacturers of automobile carburetors, have acquired the extensive plant now occupied by the Armstrong Woolen Mills, in Fairview, a suburb of Detroit, and will equip it for the manufacture of their product.

The Bennett-O'Connell Company, 3600-3604 South Morgan St., Chicago, Ill., the extensive manufacturers of plating and polishing and supplies and equipment, are to have an exhibit at the Foundrymen's Convention, to be held in Chicago, October 10th to 17th.

Attention is called to the fact that the Franco-American Chemical Works of Carlstadt, N. J., are manufacturers of amyl-acetate and refined fusel-oil. They state that these are unexcelled in quality and will suit any requirement, no matter how exacting. They particularly request that quotations and information be obtained from them before purchasing elsewhere.

The Baird Machine Company of Bridgeport, Conn., manufacturers of ball-burnishing barrels, have issued a new treatise on the use of steel balls for burnishing and which they call "Bulletin No. 303." This treatise contains a large amount of information on burnishing with steel balls and also describes the Baird barrel used for this purpose. This Bulletin No. 303 will be sent to those who are interested in the subject of ball burnishing.

The Eclipse Air Brush & Compressor Company, 228 High St., Newark, N. J., manufacturers of the celebrated "Eclipse Air-Brush" have recently issued a new booklet describing their brush. This book is well illustrated and fully describes the way to operate this interesting and valuable tool. The increasing use of the air brush in lacquering should stimulate all metal manufacturers, who use lacquer, to investigate this brush. The booklet will be sent to all who may desire it.

F. E. Myers & Bro., of Ashland, Ohio, manufacturers of pumps, have placed the contract for the erection of a large addition to their plant.

It is stated that the city of Buffalo has prevented the Williams Gold Refining Co., of 680 Main St., from establishing a gold refining plant in the building in which they are located.

The Ecothermal Stove Company of Canada, Ltd., has been incorporated in Kingsville, Ont., with a capital stock of $100,000 to manufacture cooking and heating appliances.

The new plant which will be built by the American Bronze Company of Buffalo, N. Y., will be located at Tonawanda and Arthur Sts. The foundry building will be 60 x 150 feet.

It is reported that negotiations have been completed whereby the American Cash Register Company of Columbus, Ohio will locate in Saginaw, Mich. Plans have been prepared for the erection of a large plant in that city for the company.

The Globe Pump Company, which was recently organized at Green Bay, Wis., to manufacture pumps, will manufacture a new type of mine pump. Space in the Hess Iron Works will be utilized until a plant can be erected.

The plant of the Columbia Motor Car Company of Hartford, Conn., manufacturers of the "Columbia" automobile, is to be closed and the manufacture of cars discontinued. This plant is owned by the Maxwell Motor Company.

The capital stock of the Champion Hardware Company of Geneva, Ohio has been increased from $100,000 to $200,000 to allow for the expansion of the business and also for the erection of a new foundry as heretofore the company has had their castings made by outside concerns.

The American Locomotive Co. of Providence, R. I., which has manufactured the "Alco" motor-car and truck, are to discontinue the manufacture of automobiles. The business will be confined to the manufacture of locomotives at the Schenectady and other works.

A portion of the plant of the Flanders Mfg. Co., of Pontiac, Mich., has been purchased by E. Leroy Pelletier of Detroit, Mich. and will be utilized for the manufacture of electric automobiles. A new company with a capital stock of $50,000 has been organized for this purpose and is called the Tican Electric Company.

The Manitowoc plant of the Aluminum Castings at Manitowoc, Wis., is now in full operation after an idleness of some time and is engaged principally on aluminum work for the Mitchell-Lewis Motor Company of Racine, Wis. When this plant was originally closed, it was expected that it would remain so permanently, but it has now been found necessary to take care of the western business of the company.

A copy of the new constitution of the American Electro-platers' Society is being out to each member of the association.

The plant of the American Enamel Company of Providence, R. I., which was recently destroyed by fire, will be rebuilt.

A new two-story factory is to be built by the Peerless Wire Goods Company of Lafayette, Ind. It is stated that it will cost about $5,000.

Metal novelties are to be manufactured by the Newark Sheet Metal Company of Newark, N. J. Their factory is located at 216 High St.

The Ford Motor Company of Detroit, Mich., are to build a new plant for the manufacture of wire wheels and which are to be used on their cars for the coming year.

The Rhode Island Welding & Sherardizing Company of Providence, R. I., has purchased the sherardizing business of the Providence Autogenous Welding Company.

A new brass foundry is to be built by the Medina Iron and Brass Company of Medina, N. Y., manufacturers of plumbers' goods. The foundry will be 90 x 115 feet.

The Roach Lamp Company has been incorporated in Linton, Ind., with a capital stock of $25,000 to manufacture miners' lamps. The lamps will use calcium carbide for the fuel.

A concern called the U. S. Mfg. Company has been organized in Warren, Ohio for the manufacture of hand vacuum sweepers. The factory is located in the building of the Winfield Mfg. Co.

The contract has been let for the new factory of the Stenotype Company on Mars Hill, Indianapolis, Ind. The principal building will be 52 x 500 feet and three stories high. It is stated that the plant will cost $500,000.

The capital stock of the Silver Plate Cutlery Company of Shelton, Conn., manufacturers of silver plated cutlery, has been increased from $60,000 to $80,000 and a portion of which capital, it is stated, will be used for special grinding machinery.

A plant for the manufacture of art metal goods from brass is being established by Ayling & Reichert at 1016 Monroe St., Toledo, Ohio. It is stated that such brass goods as jardinieres, cuspidors and a similar line of hollowware will be manufactured.

William T. Finkell, 100 William St., New York City, importer of industrial and technical chemicals, is placing on the market the "Peerless" brand of sulphuret of potash. This sulphuret is, he states, much superior in strength over the ordinary grade and produces a better black on oxidized work.

The Dixie Manufacturing Company, recently incorporated in Louisville, Ky. for the manufacture of motorcycle accessories, will start a nickel plating department. The plant will be located at 701 East Broadway. Tandem seats and luggage carriers will be among the goods made.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure, 98-99% | lb. | .22 |
| Acid, Acetic, pure, 30% | lb. | .07 |
| Acid, Arsenious (White Arsenic) | lb. | .10 |
| Acid, Benzoic | lb. | .55 |
| Acid, Boracic (Boric), pure | lb. | .12 |
| Acid, Hydrochloric, see Acid, Muriatic. | | |
| Acid, Hydrofluoric, 30% | lb. | .04 |
| Acid, Hydrofluoric, 50% | lb. | .10 |
| Acid, Muriatic, 20° | lb. | .02 |
| Acid, Muriatic, c. p., 20° | lb. | .07 |
| Acid, Nitric, 38° | lb. | .05⅝ |
| Acid, Nitric, 40° | lb. | .05⅞ |
| Acid, Nitric, 42° | lb. | .06¼ |
| Acid, Nitric, c. p., | lb. | .08 |
| Acid, Sulphuric, 66° | lb. | .01¾ |
| Acid, Sulphuric, c. p. | lb. | .06 |
| Alcohol, Wood | gal. | .57 |
| Alcohol, Denatured | gal. | .62 |
| Alum | lb. | .04 |
| Aluminum, Metallic, in Ingots | lb. | .22½ |
| Ammonium Sulphate | lb. | .07 |
| Aqua-Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua-Ammonia, 20° | lb. | .04¾ |
| Ammonia Water (Aqua-Ammonia), 26° | lb. | .06¼ |
| Ammonia Water, c. p. | lb. | .08 |
| Ammonium Carbonate, lump | lb. | .15 |
| Ammonium Chloride (Sal-Ammoniac) | lb. | .12 |
| Ammonium Hydrosulphuret | lb. | .30 |
| Ammonium Sulphate | lb. | .06 |
| Ammonium Suphocyanate | lb. | .60 |
| Amyl Acetate | gal. | 3.50 |
| Antimony | lb. | .08⅜ |
| Arsenic, Metallic | lb. | .10 |
| Arsenic, White (Acid Arsenious) | lb. | .10 |
| Argols, White (Cream of Tartar) | lb. | .31 |
| Asphaltum, Commercial | lb. | .05 |
| Asphaltum, Egyptian (Bitumen) | lb. | .30 |
| Benzine | gal. | .15 |
| Benzol, Pure | gal. | .60 |
| Bismuth, Metallic | lb. | 2.15 |
| Bitumen, see Asphaltum. | | |
| Blue-Vitrol, see Copper Sulphate. | | |
| Borax, Crystals or Powdered | lb. | .10 |
| Borax Glass | lb. | .30 |
| Cadmium, Metallic | lb. | .85 |
| Carbon Bisulphide | lb. | .10 |
| Calcium Carbonate (Precipitated Chalk) | lb. | .10 |
| Chrome-Green | lb. | .60 |
| Copper, Lake, (carload) | lb. | .16¾ |
| Copper, Lake, (cask) | lb. | .17 |
| Copper, Electrolytic, (cask) | lb. | .16¾ |
| Copper, Electrolytic, (carload | lb. | .16½ |
| Copper, Casting, (carload) | lb. | .16¼ |
| Copper, Casting, (cask) | lb. | .16½ |
| Copper Acetate (Verdigris) | lb. | .35 |
| Copper Carbonate, dry | lb. | .16 |
| Copper Sulphate (Blue-Stone) | lb. | .06 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream-Tartar, see Potassium Bitartarate. | | |
| Cryolite | lb. | .12 |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | lb. | .10 |
| Emery Flour | lb. | .04 |
| Emery, F F & F F F | lb. | .03 |
| Flint, powdered | lb. | .01 |
| Flour-Spar | lb. | .01¼ |
| Fusel Oil | gal. | 3.00 |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.87 |
| Gum Copal | lb. | .30 |
| Gum Guiacum | lb. | .26 |
| Gum Mastic | lb. | .80 |
| Gum Sandarac | lb. | .35 |
| Gum Shellac, brown | lb. | .50 |
| Gum Shellac, white | lb. | .60 |
| Iridium | oz. | 85.00 |
| Iron Perchloride | lb. | .25 |
| Iron Sulphate (Copperas) | lb. | .05 |
| Lead Acetate (Sugar of Lead) | lb. | .15 |
| Lead, Pig. | lb. | .04¾ |
| Lead, Red | lb | .12 |
| Lead, Yellow Oxide (Litharge) | lb. | .12 |
| Liver of Sulphur, see Potassium Sulphide. | | |
| Manganese, Ferro, 80% | lb. | .10 |
| Manganese, Metallic, pure | lb. | .75 |
| Magnesium, Metallic | lb. | 1.50 |
| Mercury Bichloride (Corrosive Sublimate) | lb. | 1.12 |
| Mercury, Metallic (Quicksilver) | lb. | .39 |
| Mercury Nitrate | lb. | 1.50 |
| Mercury Oxide, yellow | lb. | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | lb. | .08½ |
| Nickel Carbonate, dry | lb. | .60 |
| Nickel Chloride | lb. | .50 |
| Nickel Metallic | lb. | .45 |
| Nickel Sulphate (Single Salts) | lb. | .20 |
| Nitre (saltpetre), see Potassium Nitrate. | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Paraffine | lb. | .15 |
| Phosphorus, yellow | lb. | .40 |
| Phosphorus, red | lb. | 1.10 |
| Pitch | lb. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Cloride | oz. | 46.00 |
| Platinum Metallic | oz. | 48.00 |
| Potash by Alcohol, in sticks | lb. | .45 |
| Potash, Caustic | lb. | .06 |
| Potassium Bichromate | lb. | .14 |
| Potassium Bitartarate (Cream of Tartar) | lb. | .31 |
| Potassium Carbonate (Pearlash) | lb. | .10 |
| Potassium Chlorate | lb. | .15 |
| Potassium Cyanide | lb. | .25 |
| Potassium Iodide | lb. | 3.15 |
| Potassium Nitrate (Nitre or Saltpetre) | lb. | .10 |
| Potassium Permanganate | lb. | .17 |
| Potassium, Red Prussiate | lb. | .55 |
| Potassium, Yellow Prussiate | lb. | .35 |
| Potassium Sulphide (Liver of Sulphur) | lb. | .15 |
| Potassium Sulphuret, see Potassium Sulphide. | | |
| Potassium Sulphocyanate | lb. | .70 |
| Pumice, Ground | lb. | .05 |
| Quartz, Powdered | lb. | .01 |
| Rosin, Yellow | lb. | .08 |
| Sal-Ammoniac, see Ammonium Chloride. | | |
| Sal-Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .59⅜ |
| Silver Nitrate, crystals | oz. | .50 |
| Soda-Ash | lb. | .06 |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | lb. | .15 |
| Sodium Carbonate (Sal-Soda), crystals | lb. | .02 |
| Sodium Hydrate (Caustic Soda) | lb. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | lb. | .45 |
| Sodium Hyposulphite ("Hypo") | lb. | .04 |
| Sodium Metallic | lb. | .90 |
| Sodium Nitrate | lb. | .05 |
| Sodium Phosphate | lb. | .09 |
| Sodium Silicate (Water-Glass) | lb. | .04 |
| Soot, Calcined | lb. | .15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur (Brimstone), in lump | lb. | .05 |
| Tin Chloride | lb. | .43 |
| Tin, Metallic | lb. | .43¼ |
| Turpentine, Venice | lb. | .35 |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal. | .15 |
| Water-Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | lb. | .45 |
| Wax, Carnauba | lb. | .70 |
| Whiting (Ground Chalk) | lb. | .02 |
| Zinc, Carbonate, dry | lb. | .12 |
| Zinc, Chloride | lb. | .12 |
| Zinc, Sulphate | lb. | .06 |
| Zinc, (Spelter) | lb. | .06 |

# THE BRASS WORLD AND PLATERS' GUIDE

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**A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.**

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## What the Chemist Has Done for the Brass Industry.

Twenty-five years ago, the chemist was an unknown factor in the brass business and chemical analysis was rarely utilized. When it was required, which was very seldom, an outside chemist, usually professor of chemistry in some college, was called upon to make the analysis.

Now conditions have changed, and nearly every large brass concern and many small ones employ a chemist regularly or have a considerable amount of work done by outside chemists. The result has been excellent and has resulted in not only the saving of considerable money each year, but in the making of much progress in particular lines of work. The chemist has accomplished the following things for the brass manufacturer:

Guess work, as far as mixtures are concerned, has been entirely eliminated. The chemist is able to check the work of the melter or caster and many of the former "mysteries" of the working qualities of alloys have been revealed.

Samples of brass, sent in by a customer, can be exactly duplicated by making an analysis of them. Before the chemist, the color and "knife" test or scratching them, was the only method of ascertaining their composition. Small amounts of lead, tin and other metals, not revealed otherwise, are now detected with certainty.

"Secret" alloys are no longer possible, and many of the former manufacturers of such products have ceased to exist on account of the chemist having disclosed their mysteries.

Many have held tenaciously to the fact that certain treatment of fluxes have brought about the result, but the chemist has proved this to be erroneous.

The finished brass goods can constantly be guarded and too rich or too lean mixtures prevented. A case of this kind, in which the chemist proved of great value, was in the manufacture of brass pins. It was discovered that the pins were containing practically 70 per cent of copper, when that of a competitor contained 61 per cent. In this instance the first manufacturer was actually wasting 9 lbs. of copper to every 100 lbs. and the pins were not as good on account of it and were too soft.

Goods offered for sale have been tested and found of less value than those offered at a cheaper price so that the purchasing agent of the company employing the chemist has been able to avoid paying more than the market price for goods.

Raw materials, such as spelter, copper, tin and lead are tested and found unsuitable for certain uses. This has been of value in purchasing particular brands of metals which have been found of no more value for certain purposes than others.

The chemist, therefore, has entirely eliminated the matter of uncertainty in the mixing of metals, and has penetrated the secrecy that shrouded the brass industry from its beginning. To-day, the chemist is as much a need in the brass business as the actual casters or melters themselves, and his employment has changed the industry from one of the "rule of thumb" to one conducted upon a scientific basis.

## The Importance of the Current Strength on Brass Plating.

The strength of the current on brass or bronze plating is an exceedingly important portion of the operation and lack of uniformity or means for regulating it is frequently the cause of failure in this important portion of the plating business. Not only is the maintenance of a uniform current necessary, but means for regulating it must be had. A dynamo may give a certain voltage while the brass tank is running, but if it drops when other tanks are thrown in, then it will not give good results in brass plating.

In brass plating the color of the brass deposit is paramount to everything else and unless this color is maintained from day to day, the work cannot be used. To obtain this color, which is usually an ordinary yellow brass, the current must be obtained with the greatest uniformity. There is always a certain current density, indicated by the voltage, that will give the desired results, and this density must be maintained.

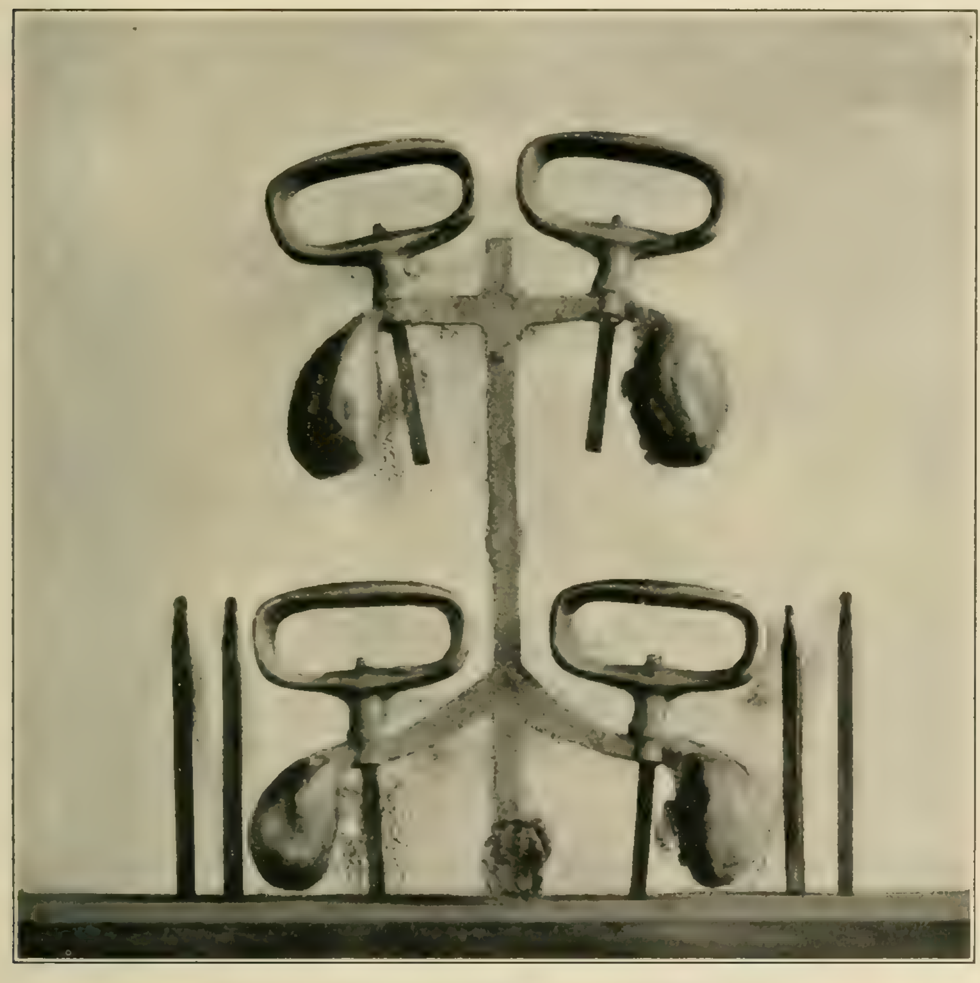
The manipulation of a brass solution is not difficult, contrary to the usual belief, when a uniform and proper current strength is obtained. It is known that too little free cyanide so that the anodes coat over, causes a variation of color on the work and so that copper, bronze, brass and zinc will often be deposited on the same article. The addition of a little cyanide so that the anodes remain clean is all that is required to correct this trouble. It is known that a brass solution that does not deposit its metal completely on an article is too lean in copper and zinc and must be built up with more carbonates. Too much gas given off from the work being plated indicates too strong a current and if the deposit that forms is thin, then too much free cyanide is present. Color is easily regulated by the addition of copper or zinc, as the case may demand.

After all these points have been corrected, however, nothing will be accomplished unless a uniform current is obtained. A suitable dynamo is necessary. One which shows a drop in voltage to a considerable extent when an additional tank is thrown on the line and cannot be restored is unsuitable for brass. A suitable rheostat is likewise essential for a brass solution for the reason that while the dynamo may give a constant output, it may be (and usually is) of too high a voltage. It must then be reduced by a suitable rheostat. There is always one voltage that is right and this must be obtained by means of a suitable rheostat.

In successful brass plating, therefore, it is essential that a dynamo be had that will give a uniform and full strength of current, and that a suitable rheostat be used which will enable one to cut down the current to the right quantity for producing the desired brass color. The successful brass platers have this equipment.

# A New Method of Casting Automobile Handles with an Iron Shank.

The casting of brass around iron has always been a problem that has perplexed some molders. Many of them have not been able to do it at all. The difficulty has been that the metal has "blown" at the portion where the iron is first struck. At first, it was believed that it was caused by the presence of grease, oil or other foreign matter, but afterwards this was found erroneous although, of course, it is necessary that the iron be free from foreign matter.



Method of Casting the Steel Shanks in the Automobile Handles.

One of the most frequent sources of difficulty in this line is the familiar carriage or automobile handle shown in the illustration and which is used for opening the doors. It is necessary to cast a square iron shank in it so that the lock may turn with the handle, and not only must the iron shank be solid in the handle, but the brass or other metal must be perfectly sound around it for the reason that it turns at this point and a good fit is required in the lock. The following has been found a very satisfactory method of casting these handles and is the process devised by George Marks of New Haven, Conn., foreman of the brass foundry of the English & Mersick Company. The method he uses, and which has proved so satisfactory that many thousands have been cast with very little loss, is as follows:

The iron or steel shank is about a quarter of an inch square. In order to prevent its pulling out, the end is turned down as shown in the illustration. This can be accomplished by turning or forging, but it has been found cheaper to turn them. Other forms may be used, such as raising a barb on the edge, but turning the end as shown has been found cheap and quite satisfactory and the shank will not pull out.

The next step in the process is to burn the shanks off in the fire. Oil, grease and foreign matter will cause the metal to "blow" when the shank is struck by it. Heat the shank to a low red heat and all foreign matter will be burned off. The ends may be burned or the whole shank iron, and if the latter is the case, then a quick way is to place a lot of the shanks in a crucible that is clean and heat them in a fire.

When the shanks are cool, (do not place in the mold while warm) they can be placed in the mold in the same manner as a core and a print is left for them by the pattern. If they are placed in the mold while warm, moisture will be driven out of the sand and which will condense on the iron as it cools, causing it to blow.

The essential portion of the operation is in the manner of molding. If the brass be cast directly on the iron shank, either a cold-shot or "blow" will result on account of the rapid chilling of the metal by the iron. One might think that the gate could be cut on some other portion of the casting other than directly on the shank itself, but it has been found inexpedient to do so for the reason that polishing then becomes more difficult and dross is apt to lodge in the most exposed part. The gating at the shank end has been found quite necessary.

The difficulty of cold-shots and "blowing" has been overcome by the use of a "shrink-ball" opposite the gate. An inspection of the illustration, herewith shown, will indicate how this is done. The ball allows sufficient metal to flow around the shank to heat it and produce a full casting. To be sure, this leaves a part to be cut off and which contains considerable metal, but it has been found far more economical than having so many bad castings. The scrap is heavy and easily melted. The process is used for brass, composition or white metal and for the alloys which contain aluminum. The principle has been found satisfactory for all.

## Nickel Plating Steel Goods to be Buffed.

One of the common difficulties encountered in nickel plating steel goods is that they rust when exposed to the atmosphere. At this day of "rust proof" coatings, more is expected of a nickel deposit than formerly, and, therefore, when rusting takes place, as it frequently does on nickel plated steel goods within a short time after plating, a customer usually begins to complain.

Much of the rusting of nickel plated steel goods is the fault of the plater and the cause is quite simple. The nickel is buffed off. This is particularly true in the case of a job shop where cheapness is considered. The customer does not expect as white a job of nickeling on steel work as would be the case with brass, and, therefore, he puts up with the color, but the rusting is the chief cause of complaint.

The difficulty is right here. A light coat of nickel is put on the work and in buffing it is partially buffed off, leaving the bare steel exposed to the air. The color of the steel and that of the nickel are so nearly the same, that it is difficult to ascertain whether the buffing has cut through the nickel or not. If a light nickel deposit only has been put on, then it is safe to assume that it has, unless a very expert buffer has been employed on the job.

There are two methods of avoiding this difficulty:

1. To copper plate the steel previous to depositing the nickel, so that should the nickel be cut through in buffing, the copper underneath will be seen, at once indicating that the nickel has been buffed off.

2. To put on a sufficiently heavy nickel deposit so that it will stand buffing without cutting through.

The method of copper plating before nickeling is an excellent one both as a preliminary deposit, and to indicate when the nickel is buffed off, but it renders the plating a little more costly as it means two operations.

The other method of putting on a heavy nickel deposit is to be recommended, but to be certain that it will not be buffed through, it must be good and heavy. A ten minute nickel deposit will not stand much buffing, but one of an hour's time will. Taking this into consideration, it is believed that there will not be much difference between the cost of the two methods.

# The Manufacture of Niello (Frequently Called "Nielled" Silver).

History is constantly repeating itself and an example of this kind is shown in the interest now displayed in a variety of silver ornamentation called "Niello". This is often called "Nielled-Silver". While its origin dates back for many hundred years, it has been little known of late and many persons are not familiar with it at all.

"Niello", or "Nielled-Silver", is made in the following manner. An article of sterling silver (or other silver alloy, as may be desired) is deeply engraved in the usual manner. The cuts of the engraved design are then filled with a *sulphide* of silver, copper and lead. This sulphide mixture is black and adheres to the silver tenaciously, and instead of the deep engraving there appear black lines. The sulphide is fused into the silver and is the most permanent black known on account of its thickness. The beauty of the article, of course, depends upon the engraving design and this is a matter that each manufacturer can alter, as his personal ideas dictate.

"Niello" is now rarely found in the trade, although a few samples can usually be obtained from some of the leading jewelry houses in the large cities. The best qualities come from Russia and naturally command a high price. Tiffany & Co. of New York City carry only a few samples of this ware, but they are from Russia and quite handsome. These articles are naturally quite expensive and a silver cigarette case, with an elaborate design in "Niello" sells for $35.00.

It would seem that the manufacture of "Niello" dates back as far as the eleventh century and, according to Percy ,the celebrated English metallurgist, an account of making and applying it was written by Theophilus, *alias* Rugerus, a priest and monk, early in this period. Percy states that an account of this discovery and the method of making is given in a translation of the treatise of Theophilus by Robert Hendrie of London. This was published in 1847 and the article is on page 237. This author (Percy) states that the method of producing "Niello" is given in other treatises and the following process is given by him in his *Metallurgy of Silver and Gold*. It is translated from a treatise called *Traité d'Orfévrerie Bijouterie et Joaillerie, etc.* by Placide Boué. Published in Paris in 1832. The translation is as follows:

"The following receipt for niello composition is stated to be used in Russia and Persia for enameling silver jewelry (argenterie niellée):

Take:

| | Oz. | Drams |
|---|---|---|
| Silver | 0 | 4 |
| Copper | 2 | 4 |
| Lead | 3 | 4 |
| Flowers of Sulphur | 12 | 0 |
| Sal-Ammoniac | 2 | 4 |

Make a paste of the flowers of sulphur and water and put it into a crucible. Afterwards melt the metals and pour them into the crucible which contains the paste. Recover this vessel that the sulphur may not take fire and then calcine over the fire that all the superfluous sulphur may be driven off. Afterwards finely pulverize the mass and make, with the addition of a solution of sal-ammoniac, a paste which introduce, by means of rubbing into the parts to be enameled. Then clean the article and place it in a furnace where it is sufficiently heated to melt the paste which fills the engraved parts and make it adhere to the metal. This done, moisten the article with a solution of sal-ammoniac and heat it in a muffle to redness, after which you may rub and polish the article when it has become cold without fear of either detaching or altering

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*The name *Niello* appears to be Italian and as the process originated in Italy, it would naturally appear to be the correct one. According to Webster's Dictionary, the Italian name is *Niello*, the Spanish and Portuguese, *Niel*, and the French, *Nielle*. The following definition is given: "A black or blackish enamel, from the Latin *Nigellus*, a diminutive of *Niger* (black). A style of ornamentation applied to metal before the invention of engraving. The process consisted in drawing upon gold, silver, etc., a design, which was then cut out with a pointed instrument, and upon the plate thus prepared, a black composition of copper, gold, silver and lead, heated together, was laid, and by heat, was made to flow into the lines of the design. The metal was then scraped and burnished, and presented the effect of a drawing in black upon gold and silver." This definition is hardly satisfactory as no mention is made of sulphur which is necessary. The only value of the definition, therefore, is in the derivation of the name.—*Editor.*

the enamel. It remains always of a very fine black color."

According to Percy an interesting article entitled "Contributions to the History of Niello-Work" by J. F. L. Hausmann is found in the *Archiv für Minerologie* for 1850, page 432. In this article is given the following tabular statement of the proportions of metals used at various times for the preparation of Niello composition. The table gives only the proportions of the metals as the sulphur and sal-ammoniac are used with it as previously described:

| *Authority* | *Silver* | *Copper* | *Lead* |
|---|---|---|---|
| Pliny | 75.000% | 25.000% | none |
| Theophilus | 66.667% | 22.222% | 11.111% |
| Biringuccio | 16.667% | 33.333% | 50.000% |
| Benvenuto Cellini | 16.667% | 33.333% | 50.000% |
| Blaise de Vigenére | 16.667% | 33.333% | 50.000% |
| Perez de Vargas | 16.667% | 33.333% | 50.000% |
| Georgi (in Russia) | 7.692% | 38.462% | 53.846% |
| Repertoire of Patent Inventions, 1827 | 5.882% | 35.294% | 58.824% |

It should be noticed that the amount of silver is the greatest in the oldest Niello composition and least in the most modern. No lead at all was used in the oldest mixture, while in the latest it was the principal ingredient.

The information given by Roseleur the well known electro-metallurgist is of much interest as it would appear to represent the practice of the French at the time his Galvanoplastic Manipulations were written (1846). He has devoted a chapter in his book to the manufacture of Niello and it is as follows:

"This product which still bears the name* of the inventor, is truly a kind of inlaid enamel work, and is obtained by the sulphuration of certain parts of a silver object. But this sulphuration, instead of being direct like the ordinary "oxidizing" method, is made by inlaying the silver surface with a sulphide of the same metal prepared beforehand.

After having produced the *niel*, an operation which consists in forming a triple sulphide of silver, lead and copper and reducing it to fine powder, which is mixed with a small proportion of a solution of sal-ammoniac, the artist hollows out the engraving upon a silver surface and covers the whole, hollows and relief with the niel composition. The article is then heated in a muffle until the composition melts, and becomes soldered to the metal. The pattern is then uncovered by a level polish when the silver will appear as over a black ground

The niel composition is made in the following manner: A certain proportion of sulphur is introduced in a stoneware retort or deep crucible. On the other hand, a certain quantity of silver, copper and lead is heated in another crucible, and when melted is poured into the fused sulphur, which transforms these metals into sulphides. A small portion of sal-ammoniac is then added, and, after being removed from the balloon, crucible, or retort, the product is pulverized and is ready for use.

Here are, however, the proportions indicated by Mr. Mackenzie who has paid much attention to the subject:

| *First Crucible* | |
|---|---|
| Flowers of Sulphur | 750 grams |
| Sal-Ammoniac | 75 grams |
| *Second Crucible* | |
| Silver | 15 grams |
| Copper | 40 grams |
| Lead | 80 grams |

The contents of the second crucible, after fusion, are poured into the first. We consider it would be preferable to diminish the proportion of lead, the sulphide of which impairs the blue shade of the niel and corrodes too deeply.

The foregoing method of making nielled silver is costly, since each article must be engraved. The arts have called to their aid another and cheaper process, which consists in engraving in relief a steel plate, and compressing it against a silver plate between two hard bodies. The copy is, therefore, hollow and is ready to receive the niel. A great many copies may be obtained from the same matrix.

Such is the method by which a quantity of nielled articles are manufactured, such as the

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*Roseleur called it "Niel or Nielled Silver", but it is believed that the term "Niello" is the one in general use. Which is correct is unknown, but "Niello" seems to be used in the trade at the present time.—*Editor.*

so-called Russian snuff boxes, cases for spectacles, sugar-plum boxes, etc.

Nielled silver is generally sold at about 10 cents per gram, and at such a price the weight of the article must be sufficiently great to pay for the labor.

Would it not be possible to obtain the niel by the following process:

A drawing or pattern cut upon thin paper, like lace paper, is dipped into a thin paste of niel composition, or into a concentrated solution of some sulphide, and then applied to a silver surface which is afterwards heated in a muffle. The heat will destroy the organic substance and a pattern will remain formed by the composition absorbed by the paper. Artists and manufacturers may try this process if they think it sufficiently valuable."

As far as known "Niello" is not manufactured in the United States as it has been deemed too expensive to make. It might be possible by following Roseleurs instructions, previously mentioned, to produce it cheaply, but usually such modifications are only makeshifts and are undesirable upon such expensive wares as those of sterling silver. If one is to use an imitation process, it is as well to use a very cheap one, not one which approaches the real process in cost.

## Melting Points of Refractory Metals.

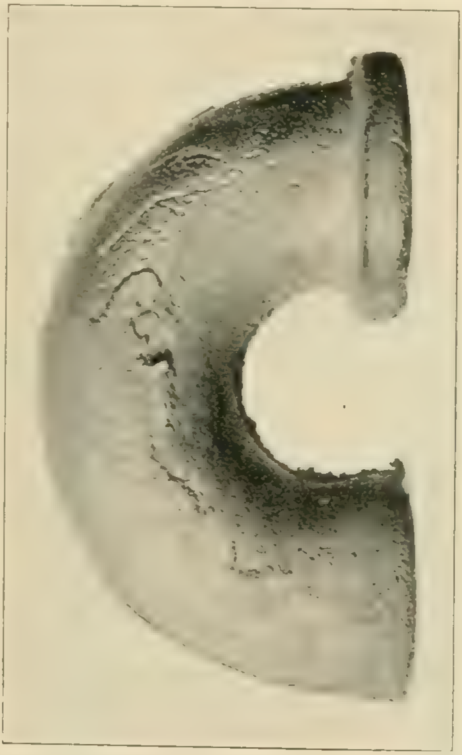
The melting points of some of the refractory metals have recently been determined by G. K. Burgess and R. G. Waltenberg and the results given in the *Journal of the Washington Academy of Science.* They are as follows:

| | C | F |
|---|---|---|
| Titanium ....... | 1795 | ...... 3263 |
| Vanadium ...... | 1720 | ...... 3128 |
| Chromium ..... | 1520 | ...... 2768 |
| Manganese ...... | 1260 | ...... 2300 |
| Iron ............ | 1530 | ...... 2786 |
| Cobalt .......... | 1478 | ...... 2692 |
| Nickel .......... | 1452 | ...... 2545 |

The determinations were made with a micro-pyrometer and the metals were melted in hydrogen gas to prevent oxidation. In some cases, however, the metals were melted in an Arsem electric vacuum furnace.

## Cause of "Blowing" of Yellow Brass Castings in the Mold.

Yellow brass castings, even though they may be cast without any core, frequently "blow" in the mold. Cores, of course, are a frequent cause of this difficulty and the "blowing" is often laid to them even when they are not to blame. A case of this kind is shown in the illustration herewith given.



**Brass Return-Bend, Showing "Blow" from Sand in Cope.**

It will usually be found that such a "blow" will occur on the top or cope side of the casting, and that herewith shown occurred in this place. All molders are familiar with a "blow" in a casting. The surface is wavy and has the appearance of cold metal which did not unite while cooling. If, however, the remainder of the casting be examined it will be found that the metal was sufficiently hot.

The difficulty is caused by the fact that the hot metal, as it reaches the top side of the mold, comes in contact with the wet sand and forms steam and gas. If there is no opportunity for the steam and gas to escape, then the liquid brass is "blown" by it, so to speak, with the result that the metal is [illegible] tated. As it is not ready to solidify, the result is that it does not settle back to a solid or homogeneous mass and it has the appearance of a cold-shut which, of course, it is in one sense of the word.

The "blowing" of a yellow brass casting when the liquid metal reaches the cope side of the mold, may be caused by one or more of the following:

1. By the sand being too wet so that there is too much steam formed which cannot escape.

2. By the sand being rammed too hard so that there is no opportunity for the steam or gas to escape.

3. By the use of too fine sand so that the steam and gas cannot escape.

4. Lack of proper venting.

While any of the preceding causes may result in a "blow" a combination of all of them may frequently take place. It is not infrequent that it does happen this way.

The use of too wet sand is quite a common cause of a "blow" and is apt to take place more frequently when molding machines with inexperienced operators are employed for the molding. The sand is dumped from molds, wet down and riddled and sufficient time is not given it to "soak" so that there is obtained a uniform "temper". Certain portions of the sand may be too wet with the result that the melted brass will "blow" when it strikes it. Then again, a molder will often swab around the edges of the mold and cause the sand to become too wet. This will result in a "blow" like that produced when the sand is uniformly too wet. So much steam is formed when the hot brass strikes the sand that it cannot escape. The result is the "blowing" of the metal and it solidifies before it settles back to its normal position.

Sand rammed too hard is another frequent source of "blowing". It is easy to ram sand too hard and if there is any danger of its being done, then a vent should be put in the highest part of the mold through the cope so that steam and gas may escape. Venting is an excellent thing in all instances, but there is some objection to it on account of the fact that it leaves a bad spot on the surface of the casting when the vent is broken off.

Too fine sand is a more frequent cause of "blowing" than is generally believed and is caused by the desire, on the part of the manufacturer, of obtaining smooth castings. This is a strong desire and a casting that is slightly rough, on account of a coarser sand being used, is not unsightly. In fact, it has a much better appearance than one would imagine. If polished, then it will make little difference. Those who are experiencing difficulty from "blowing" and are unable to locate the trouble, should investigate the sand and it will be found that in many instances, too fine sand is being used. A sand that will give good results on small castings, will not answer for larger ones and it has been noted that in a large number of instances, where a very fine sand is used for yellow brass work, "blowing" results.

Yellow brass, of course, generates more gas while being poured than red metals and requires a more open sand, and a good opportunity for the gas and steam to escape.

## Bronze Plating Solutions Containing Tin.

A true bronze consists of copper and tin, and one would naturally think that these two metals should be used in making up a bronze plating solution. This idea, however, is wrong and it is rare indeed to find a plater who has ever used tin in a bronze solution. The necessary bronze color can be obtained by the use of copper and zinc and it is these two metals that are so extensively used in bronze plating.

The objections to the use of tin in making up a bronze plating solution are as follows:

1. The solution containing tin is more difficult to maintain than one containing zinc.

2. Tin is far more costly than zinc.

3. As far as known, it is very difficult to obtain as good a bronze color with the tin, although theoretically it should present no difficulties. The color usually obtained by the use of tin is not as good a bronze color as it is when zinc is used.

The difficulty of obtaining a bronze color is singular for the reason that the alloy of the two metals is the true bronze color. Those who desire to try the tin, can dissolve some tin salts in cyanide and add to a good cyanide copper solution until it plates a bronze.

As there is no objection to the use of zinc in a bronze solution and it is cheap, the employment of tin is not required.

# "Burnt" Deposits and their Effect on Nickel Plating.

One of the first things a young electroplater learns is to recognize a "burnt" deposit, and he is taught that in all instances of such a kind the current is too strong. He follows this advice and soon finds it correct. He then never fails to recognize a "burnt" deposit as it is so simple to ascertain it with the eye. While this recognition of a "burnt" deposit is all right as far as it goes, the young plater should be instructed in the fact that, although a nickel deposit may not have dark edges, it may, nevertheless, be "burnt" in the full sense of the word. When the nickel deposit has dark edges, like that shown in Fig. 1, the case is an extreme one and is very easily recognized; but if a less current density is used so that no dark edges or lack of uniformity in the deposit can be noticed and it has the appearance indicated in Fig. 2, then the deposit may still be "burnt" although it may not show it.

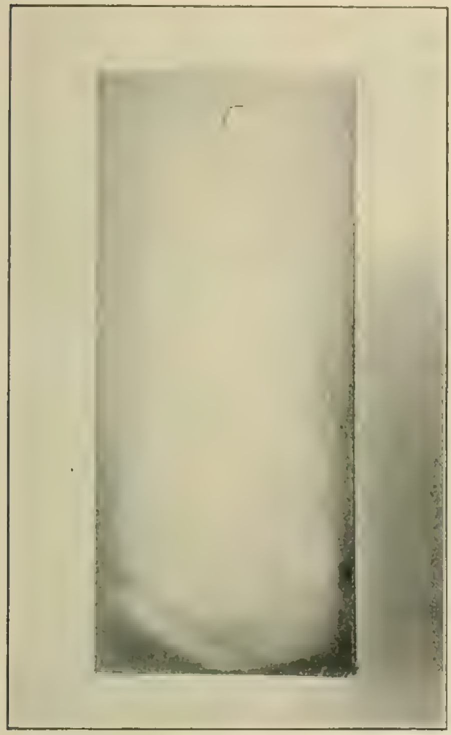


Fig. 1. Ordinary "Burnt" Nickel Deposit.

It is this class of "burnt" nickel deposits that will frequently bother a plater as he cannot tell by the eye that the burning has taken place. Take, for example the case of the nickel deposit shown in Fig. 2 This deposit was obtained in the same nickel solution as that which produced the "Burnt" deposit shown in Fig. 1, but a little less current density was used or just enough to prevent the formation of the black edges. The color was good and uniform and one would believe that the deposit was a good one. It was far from it, however, and this fact was quite noticeable when it was buffed. Ordinary rouge or Vienna-lime had comparatively little effect on it and a hard crocus was necessary to cut it. It was impossible to obtain the desired color on it and it had a "steely" shade. When the sheet brass, upon which the nickel had been deposited, was bent, the nickel flaked off.

The question of "burnt" nickel deposits, then, is not one of actually "burning" them so that the edges become black and rough, but also of causing the deposit to be put on at such a high current density that it becomes hard and brittle. The "burnt" deposit with the black rough edges is an extreme case and is so easily noticed that it rarely takes place

Fig. 2. Uniform Nickel Deposit, but Hard from Slight "Burning."

in actual plating; but in the other case or that in which the deposit is of uniform color but hard, it is not apparent except when finished or when polishing takes place.

It is apparent, then, that it is possible to "burn" a nickel deposit without becoming visible to the naked eye and that the current density or strength is the cause of it. Let it be said that to obtain a soft, white nickel deposit the current density or strength must be low or weak and that a uniform color of the deposit does not signify it is not, at least, partially "burnt", though it may not show the customary black and rough edges. A weak current means a soft and white deposit.

The cause of the "burning" of a nickel deposit is the absorption of hydrogen gas given off at the cathode or surface of the work being plated. Metals have the property of absorbing hydrogen gas and some absorb it more readily than others. Nickel seems to have the property of absorbing it readily, when this gas is given off at the cathode as it is when the current density is excessive, and hardness results. Hydrogen gas hardens metals, and it is for this reason that a "burnt" nickel deposit is so hard and requires to be cut down with greens or emery. A soft deposit does not contain it. When the condition becomes such that the nickel deposit has a black edge, then a still further absorption of hydrogen gas takes place and probably together with an oxidation and the formation of a black nickel oxide. Just what this change is, is not clear, but it is known that hydrogen gas is absorbed by the nickel and renders it hard.

The remedy for a hard nickel deposit is obvious. Cut down the current.

It is not infrequent to hear a plater say, "I have not changed the current in my nickel bath and yet the deposit burns." This is apparently caused by the increasing strength of the solution, on account of evaporation, or the addition of a conducting salt like sal-ammoniac, or the introduction of extra nickel salts. Whatever is done serves to increase the conductivity of the nickel solution, and at the same voltage a greater quantity of current will pass. To use the voltmeter in plating, it is always necessary that the solution be maintained in a uniform condition. An ammeter, of course, would at once indicate this extra current.

# Note on Sand-Blasting Nickel Anodes.

The value of sand blasting nickel anodes has always been a subject of discussion. Many makers maintain that, while it does no harm it does no good, and only increases the expense and that those who do it are obliged to use the method to make a bad casting marketable.

The argument may or may not be well founded and it is agreed by all manufacturers that sand blasting does not injure a nickel anode. The question then resolves itself into one of whether it is good policy or not. Those manufacturers who are able to turn out a nickel anode casting that is clean enough for the market naturally do not advocate the use of a sand blast as it increases the cost.

Indications point to the fact that a nickel anode, even though the surface may be clean, is improved by sand blasting. All castings of a metal or alloy which contains carbon, such as nickel or steel, are chilled to a greater or less depth when cast in sand, particularly in "green" sand. This chilled or hard surface is not as readily soluble as one which is softer and the softer surface, of course, is underneath the chilled portion. Nickel anodes do not appear to chill to any depth that is appreciable, and the sand blast has, apparently, removes the hard, chilled skin and exposes the soft nickel. It is believed this fact explains why new anodes do not work as well as those which have been in the bath for some time so that the outer skin of nickel is removed.

The question then rises, will it pay to go to the extra expense of sand blasting the anodes to render them more soluble at the start? Even though they may have a hard skin or chilled surface, this is removed in the bath and no nickel is lost. After it is removed, the anodes are as good as those which have been sand blasted.

Investigation has indicated that only one nickel maker is now sand blasting his anodes. The other manufacturers claim that it is not only unnecessary but superfluous.

## An Experimental Electric Furnace Plant.

At the present time, more interest is being displayed in electric furnaces and methods of heating by electricity than in any other line of furnace work. The electric furnace for heating and melting metals is a particularly attractive one for many reasons. First, it means the concentration of heat where desired. Second, it is so easily controlled that furnaces may be placed in locations impossible with other types. Third, there are no products of combustion to affect the metal. Fourth, temperatures can be controlled by varying the resistance.

The electric furnace has not been applied successfully to the brass industry, although it has made much headway in steel melting. It is, without question, a matter only of time when the electric furnace will be utilized for brass melting and probably for annealing as well. The reason why it has not yet been utilized is the fact that practical obstacles have been encountered that have militated against the economical application. These, undoubtedly, will be overcome in time.

It is seldom that one finds a plant devoted exclusively to experimental work, and one devoted only to electric furnace work is still more rare. Such, however, is the plant of the Continuous Zinc Furnace Co. of Hartford, Conn. and while it was established for experimental work on zinc ores, it has developed into other lines of electric furnace work and the melting and annealing of brass is a subject that is now occupying their attention. This experimental plant is called the Continuous Zinc Furnace Company for the reason that the development of an electric furnace process for the continuous smelting of zinc ores has been completed.

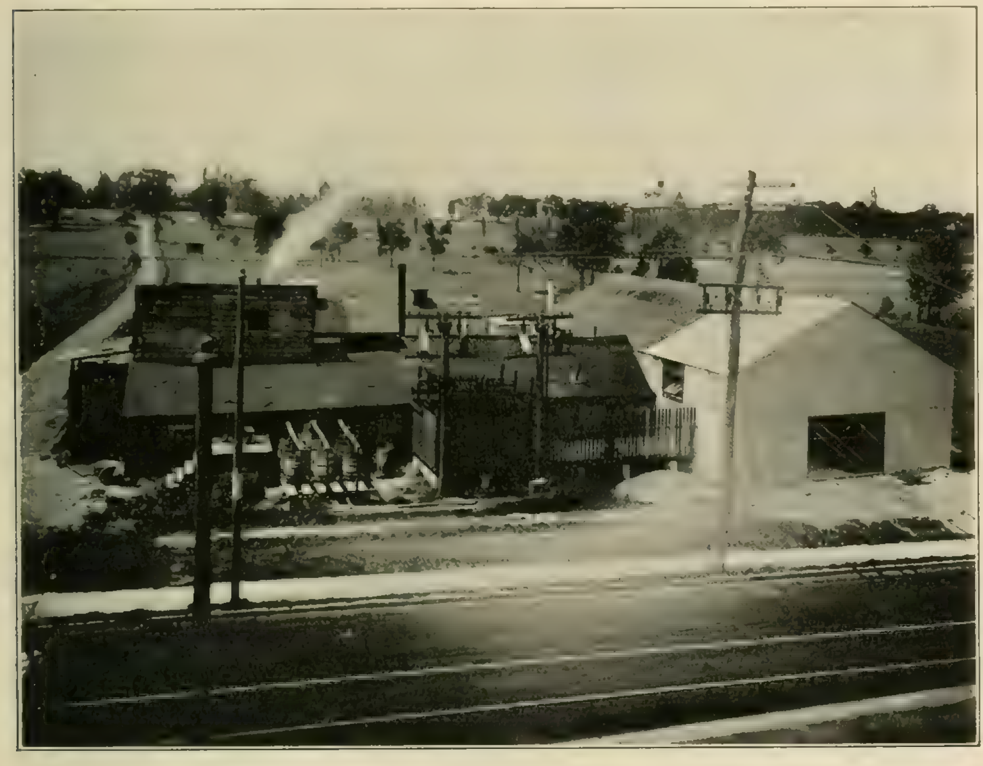


Fig. 1. Experimental Plant of the Continuous Zinc Furnace Co., Hartford, Conn.

The plant of The Continuous Zinc Furnace Company, located at No. 599 Broad Street, Hartford, Conn. presents several features of interest to the metal world.

Woolsey McA. Johnson, president of the concern, who was formerly an electrical engineer, took up in 1904, when superintendent of the No. 2 Works, and metallurgist of the Lanyon Zinc Company, the question of continuous zinc ore smelting in the electric furnace and has been engaged on the problem ever since.

In October, 1907, he started work on a small furnace building, 16 x 32 feet. In November 1907 he started work on testing out some of his ideas in a new form, with the assistance of two boys. The work and plant have grown in the past six years and The Continuous Furnace Company plans to build, as soon as frost is out of the ground next spring, a commercial plant, either in Montana or Colorado, smelting in their new type of furnace complex lead-zinc ores of which there is a large tonnage now commercially valueless in the West. In the meantime they are developing several types of furnaces that would have use in New England, such as an electric furnace for making brass, and an electrically heated forge-bar furnace.

Mr. Johnson graduated from Trinity College in 1898. He studied electro-chemistry and electro-metallurgy at a German university, and engineering and metallurgy at Harvard. On leaving Harvard in 1901 he entered the employ of Col. Robert M. Thompson of the International Nickel Company, traveling in Europe, Canada and this country, looking up new processes. He also worked as a laborer at the Orford Works of the International Nickel Company. He entered into the zinc business in 1903 and with a few exceptions has been concentrating and specializing ever since in that field of metallurgy.

The plant of The Continuous Zinc Furnace Company has grown and its general outside business has enlarged gradually.

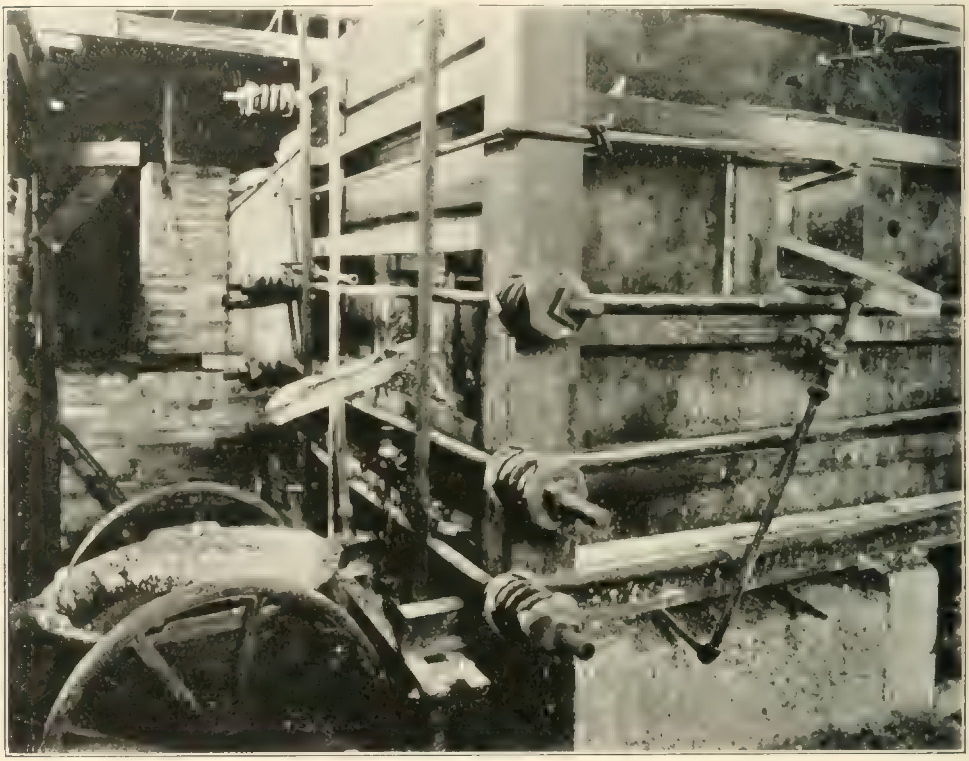


Fig. 2. The Zinc Furnace in Which Many Tons of Spelter Have Been Made.

The force consists now of four technical assistants, a stenographer, and five practical workmen, with tools and machines to do almost any kind of experimental metallurgical work in furnaces. The floor space is 4584 square feet at present and a new addition will be made before winter.

The superintendent of the plant is Burdette L. Farnham, a graduate of Trinity College. Mr. Farnham was at one time in the contracting business and is a trained chemist as well. His method of tapping slag and stopping flow of same has excited the admiration of several of the best known metallurgists in the country and he has made several other important practical discoveries.

E. W. Hale, a graduate of the Case School of Applied Science, is chief chemist. He was formerly chief chemist of the Lanyon Zinc Company and later superintendent of the Springfield (Ill.) Works of the United Zinc and Chemical Company.

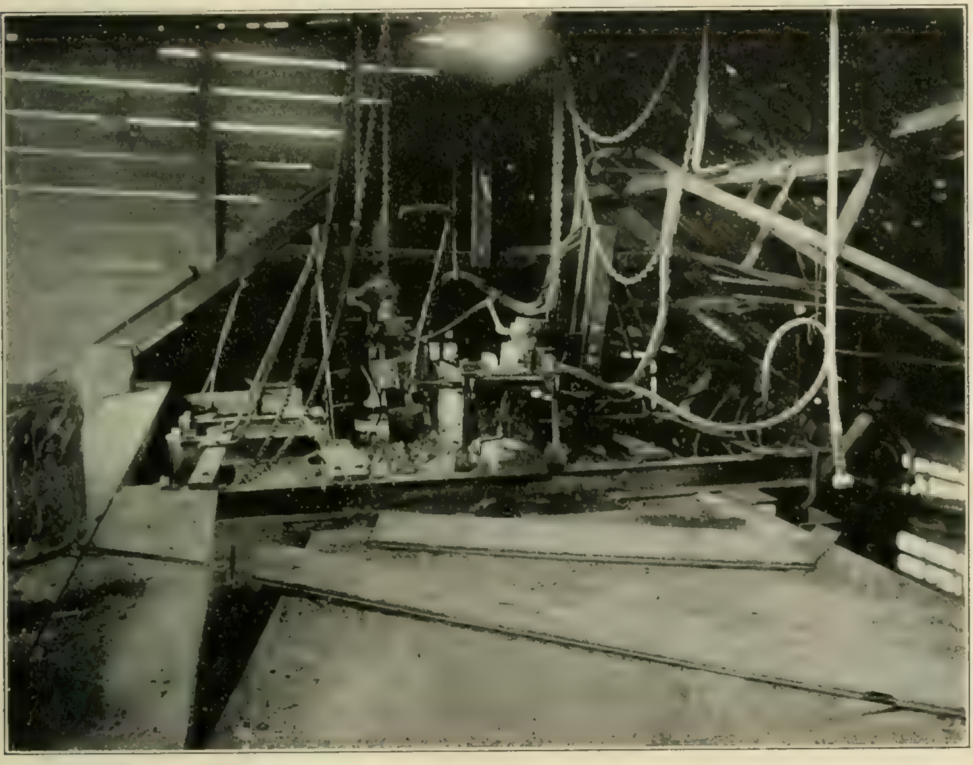


Fig. 3. Top of the Zinc Smelting Furnace Shown in Fig. 2.

E. N. Morrill a graduate of Bates College, with twenty years' experience in Western smelting works, has charge of the smelting runs.

George N. Sieger, a graduate of Lehigh University, and formerly chemist in the laboratory of the Palmerton plant of the New Jersey Zinc Company, is metallurgical accountant.

There is a well-equipped office and chemical laboratory. The research laboratory possesses muffle and crucible furnaces, fired by gas and several special electric furnaces. A great deal of research work is always under way.

The power is all purchased from the Hartford Electric Light Company under a special rate, with restrictions against use between the hours of 4:00 P. M. and 8:00 P. M., during the months of December, January and February. 100 K. W. minimum, with a maximum of 200 K. W. is available at any voltage from 25 to 220 volts. Movable pyrometers and electrical measuring instruments are kept in the stock room, and some are mounted permanently in convenient spots.

The shop has 3 drill presses, lathe, power hack-saw, blacksmith-forge, and a full line of tools for working wood and metals in such a manner as this plant needs. The stock room has a working supply of fire brick and magnesia brick of all shapes and sizes steel and iron, electrodes, pipe and pipe fittings, copper bus-bars, and cables. Power is supplied by three motors conveniently placed.

The attempt has been made to purchase only such material as was needed for the actual pressing needs of the development work.

As a by-product of the inventing work, The Continuous Zinc Furnace Company is developing several types of furnaces. The first of these is a furnace for heating by electricity forge-bars. Some work is also being done on a furnace for smelting zinc and copper to make brass, and it is believed that there is a wide field for a furnace possessing the characteristics that The Continuous Zinc Furnace Company's brass furnace has.

veloped state. Considerable work has been done on a furnace for melting down skeleton brass and skeleton bronze, fluxing off such impurities as this stuff might gather by means of a slag. Substantial progress has been made on a furnace for taking cast iron turnings and borings, likewise steel turnings and steel borings, and melting these down electrically in a continuous operation, thereby making a first-class pig iron product or a first-class steel product, to be cast either into ingots or pigs or for special foundry work.

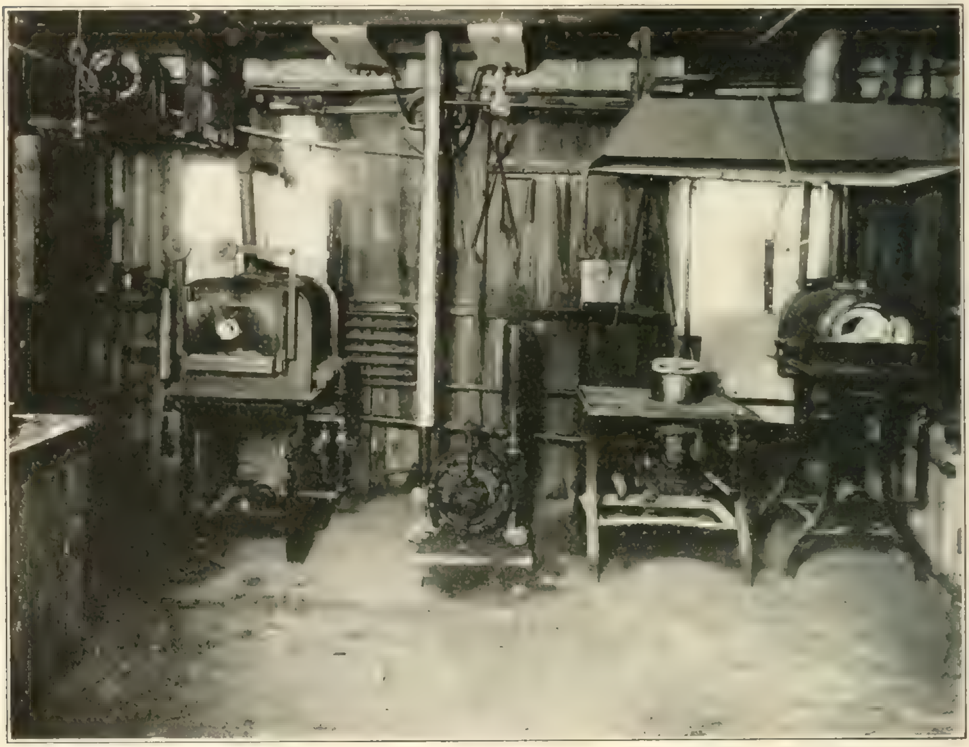


Fig. 4. The Laboratory of the Continuous Zinc Furnace Co.

Of course, The Continuous Zinc Furnace Company recognizes that a successful furnace for melting brass by electric heat should possess a design of a practical nature and should have characteristics that appeal to the practical brass melter. All this is being considered in the experimental work which has been done at the Hartford plant on the melting of brass in the electric furnace. Besides the brass melting furnace there is some work being done on electric furnaces for annealing brass sheets. This is a much simpler task and the furnace is in more or less of a de-

This work is all being done with the idea that it is impossible to develop anything of a practical nature and something that is substantial and something suited to the needs of the industry without a considerable period of time and without allowing the results of the experiments to be fully digested before another step forward is made. This is the main reason why several different classes of work are being done, instead of concentrating to some extent on one or two lines.

However, the electric zinc smelting furnace is, of course, the main objective point on which the Continuous Zinc Furnace Company is concentrating its efforts. Mr. Johnson has made altogether some 30 or 35 tons of spelter from ore treated in the electric zinc furnace.

The general wide-spread receptive attitude by the mining men for such a furnace changes itself and takes the form of a general credulity. It was remarked in Denver that "the Continuous Zinc Furnace Company has made altogether as much as a ton of spelter in the electric furnace," and this was spoken doubtfully. To show the powerful effects of the electric furnace the following figures are given:

Slags from upper tap hole, average sample taken from 104 taps; total 16.9 tons in the period June 1, 1912 to June 30, 1913, in runs on complex lead-silver-gold-copper zinc ores:

Copper 0.065%

Note: Electrolytic assay on a 5 gramme sample.

| | |
|---|---|
| Zinc | 5.25% |
| On 4 Assay Tons Silver | 0.50 oz. per short ton |
| On 4 Assay Tons Gold, less than | 0.01 oz. per short ton |
| Lead, wet, | 0.05% |

Note: Lead determination was on a 5 gramme sample.

The endeavor of the Continuous Zinc Furnace Company is to conduct their experimental work and their inventing work on as near as possible a business basis, and it is clearly realized that this is a difficult task in a business developing new things where the amount of uncertainty is always large and sometimes of an extreme nature. The general policy is to estimate the chances as far as possible by discussion and to gain the maximum amount of information from any experiment and to do the experimental work as far as possible on the drafting board or in cheap apparatus. Finally, when the work assumes a definite form the apparatus is made more practical and more workmanlike. The keynote of the laboratory is that the relation between the experimentally expended dollar and the dollar that is returned from the process should it be successful, be the maximum. In a book which two of the members of The Continuous Zinc Furnace Company are writing, it is stated that a short ton of coal having a thermal value of 11.147 b. t. u. per pound has exactly the same number of heat units in it as an electrical horse power year. As coal costs from $1 to $5 a ton in the East and power costs from $15 per horsepower year to as high as $100 per horsepower year for electric heating in the East, it is clearly seen that to compete with heating by coal the electric current must be employed only in such cases that its efficiency in other ways makes up for the primal disadvantage of increased cost of the electrical b. t. u. as against the b. t. u. derived from the combustion of coal.

## New Books.

THE SCIENCE OF BURNING LIQUID FUEL by Wiliam Newton Best. The interest now displayed in oil fuel for the heating and melting of metals renders this book opportune. Heretofore there has been no satisfactory literature on the subject. The author is a man of the most extensive experience in the burning of liquid fuel and has had twenty five years connection with the designing and operation of oil furnaces. He has also been granted many patents on the subject, both on burners and the furnaces themselves. The book was written at the request of many of his clients. The information contained in the book will be found of the utmost value to those now engaged in the use of oil as fuel, or those who desire to investigate its merits. Heretofore there has been much unsatisfactory information spread broadcast about fuel-oil and in this connection the author says: "Liquid fuel can be consumed very wastefully or can be burned most economically". The book is compiled in an excellent manner and illustrated with many photographic reproductions and drawings. It is 6½ x 9½ inches in size; the price is $2.00 postage paid. The book contains 159 pages. It is for sale by the author, W. N. Best, 11 Broadway, New York City.

## A New Process for Enameling Silver and Other Metals.

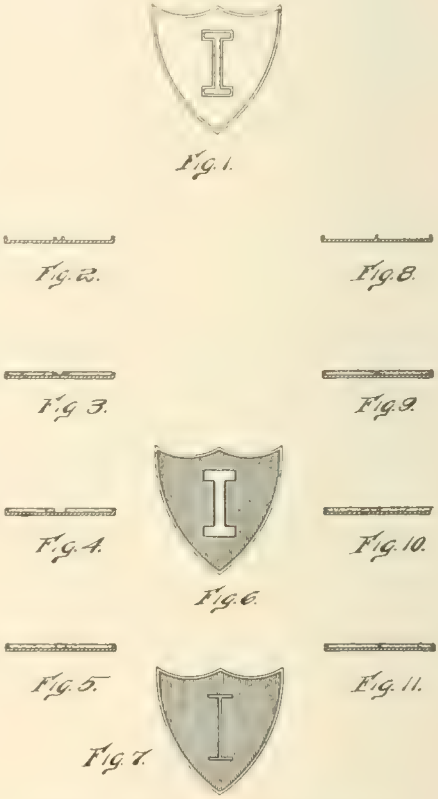
A new method of enameling silver and other metals has recently been patented by Walter L. Shepard of the Shepard Mfg. Co., of Melrose Highlands, Mass. The novelty of the invention lies in the fact that it is possible to produce an enamel of different colors without the necessity of having a ridge or partition of metal to separate the different colors. The process is described by the inventor in the following manner:

"My invention relates to a novel process for making enameled articles as for instance jewelry, souvenir buttons, name plates and the like which are ornamented by having upon their surface designs made from enamels of different colors. Such articles whether champlevé or cloisonné heretofore have been made with the enameled areas of different colors separated from each other by a metal partition, the edge of which is generally visible on the surface of the finished article and appears as a narow line of metal between the adjacent areas. In cases where it has been desired to produce a narrow line of enamel of a different color from the enamel in the adjacent areas, the fineness or narowness of the line of enamel has been limited by the fact that it must be inclosed between the two metallic partitions. It has therefore been found practically impossible to make fine lines of enamel or delicate tracery by either the champlevé or cloisonné processes.

I have found that by the employment of my new process it is possible to produce an enameled article in which the edges of adjacent areas of enamel of contrasting colors actually abut each other without any intervening metallic partition, the line of division between the two being clean and smooth. It is therefore possible by the employment of my novel method to do finer work than has heretofore been possible, and produce effects which have heretofore been unattained. In the articles produced by my novel process, there is no line of metal between the adjacent areas of contrasting enamels.

The invention will be fully understood from the following description taken in connection with the accompanying drawings and the novel features will be pointed out and clearly defined in the claims at the close of the specification.

Referring to the drawing Figure 1 shows a metallic base ready for the application of the enamel. Fig. 2 is a section of Fig. 1, Figs. 3, 4 and 5 are similar sections showing successive steps in the process. Fig. 6 is a view of the finished article. Fig. 7 is a view of a similar article, illustrating the application of the process in the production of fine lines of enamels of contrasting colors. Figs. 8 to 11 are sections showing the successive steps in the production of the article shown in Fig. 7.



**Method of Making the Enameled Silver.**

In Fig. 1 is shown a recessed metal base prepared for the production of the enamel shield shown in Fig. 6, the finished shield having a field or ground of red enamel and on it in white the letter I in a broad block letter, the whole shield being surounded by an edge or border of metal. The metal base is stamped or died so that there is a raised rim around the edge of the base and a partition or ribbon around the figure which is to be produced in enamel. The partition or ribbon is fixed with relation to the base and is preferably formed integral therewith, as shown in the drawing. This base is formed exactly as for champlevé work. The field which is to be formed of red enamel is then filled in with the enamel powder and the article is fired in the usual way to cause the enamel to flow and fill the area of the field. Thereafter the partitions are removed preferably being treated with acid, portions which it is desired to have remain being covered with suitable wax or enamel. The article in this condition is shown in Fig. 3, the space between the two partitions being shown covered with enamel, so that the acid will attack only the partitions. In doing this work, I have found it frequently convenient to use a thin coating of enamel to protect the metal portions because it may readily be removed by stoning. The condition of the article after having been treated with acid to remove the partitions is shown in Fig. 4. The space between the two sides of the field of red enamel is then filled with white enamel powder, as shown and the article is again fired or baked to flow this portion of the enamel. The edges of the two areas of enamel are then in contact with each other and their top surfaces are substantially on a level. After this, the article is stoned and polished. The process described results in an article having two adjacent fields of enamels of contrasting colors, the edges of the said fields being in contact with each other and not being separated by any metallic partition. The line of demarcation between the two adjacent areas of enamel is sharp and clean, and therefore the ornamentation on the article has an appearance not heretofore found in enameled goods.

Referring to Fig. 7, there is shown a shield having a field of red enamel upon which is produced the letter I in fine, white lines. The form of the white metal base for the production of this article is shown in Fig. 8, there being a single fired partition of metal. In Fig. 9 the ground is shown as having been filled with red enamel powder and baked to form the area of red enamel. Then the partition is removed, leaving a space between the two partitions of the field. This space is filled with white enamel (see Fig. 11) and the whole fired and stoned in the manner previously described. By making the partition very thin, a very fine line of enamel may be produced. In this manner delicate tracery or other ornamentation may be made."

## Use of the Salt Water Gilding Solution as a Dip.

It is not generally known that the usual salt-water gilding formula, now quite extensively used for gilding by means of the porous stone crock and copper kettle, may be used as a dip gilding formula, and in fact, it is used by some platers in this manner without any current at all.

There may be some classes of goods which can be gilded in this manner, but there are others which cannot advantageously be treated in the dip without the use of a current. Those who desire to use the dip without the current will find that the color is equal to that obtained with the current, but the gold does not cover as well.

The following bath can be used with good results:

| | |
|---|---|
| Water | 1 gallon |
| Yellow Prussiate of Potash | 4 oz. |
| Phosphate of Soda | 2 oz. |
| Carbonate of Potash | 1½ oz. |
| Sulphite of Soda | 1 oz. |
| Metallic Gold | 2 pennyweights |

The gold is "cut" with aqua-regia (muriatic acid and nitric acid), the acid evaporated off until the solution is syrupy, then diluted with water and the gold precipitated as fulminate with ammonia. This is filtered out, washed with water *but not allowed to dry*. It will explode when dry, but is entirely harmless while wet. As soon as washed, dissolve in the solution previously made.

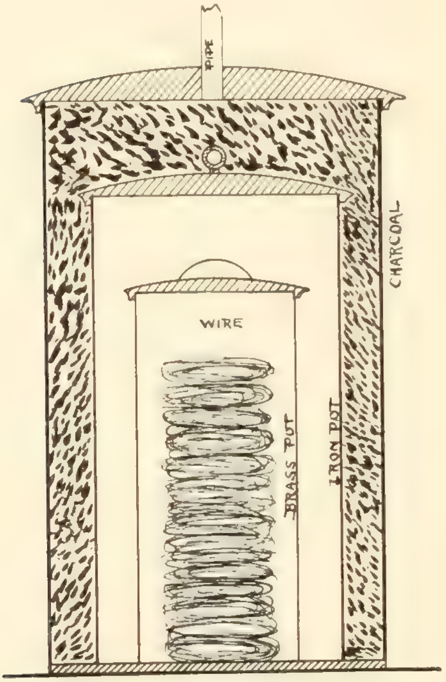
The solution thus made with gold, is boiled for about half an hour and the black precipitate in it will change to a red. This is caused by the iron and it should now be filtered out.

The clear solution will be slightly yellow and is now ready for the dip. It must be heated to 150 degrees F. or over when used.

Brass or copper goods can be dipped in it, and other kinds of material, such as iron or steel, zinc, lead or German-silver must be plated with either of these metals before dipping can be accomplished.

## Annealing Phosphor-Bronze Wire.

One of our subscribers has experienced difficulty in annealing phosphor-bronze wire of fine guage. He has annealed it in the same manner as steel and, in fact, he has been accustomed to manufacture steel wire and has treated the phosphor-bronze in the same manner. He has found this difficulty: The wire, particularly at the bottom of the pile of coils, sticks together. The accompanying sketch shows the manner in which he has annealed the wire.



Wrong Method of Annealing Phosphor-Bronze Wire.

The wire, in coils, is placed in a brass retort or pot and this is set inside of another and larger iron pot. The two are then placed inside of a large iron pot and the space around is filled with charcoal. A pipe at the top allows any gas which may be generated to escape. The whole is placed inside of a muffle furnace and heated to anneal the wire, and the object of using this complicated piece of apparatus is to prevent oxidation during annealing.

The principle is all right, as far as preventing oxidation during annealing is concerned, but the difficulty lies in the fact that the coils of phosphor-bronze wire, on account of containing so much copper and also because it remains practically bright and free from oxide during the annealing, will adhere to one another if the temperature reaches the right heat. On this account it cannot be said that it is the best method of annealing phosphor-bronze.

The phosphor-bronze should be annealed in an open pan and placed in a muffle. In this manner there will not be sufficient weight to cause the wire to adhere, and at the same time it will oxidize and form a scale which will also effectually prevent the strands of wire from sticking to one another. A low heat must be used and if a very low red is obtained it will be found satisfactory. In this manner it is possible to anneal the wire without any difficulty, but, of course, it will be covered with a black scale which may readily be removed by means of a sulphuric acid pickle. A mixture of 1 part of acid and 10 parts of water will remove the scale within a short time.

Our subscribers difficulty was mainly caused by the weight of the pile wire which pressed on the bottom coils and caused them to adhere to one another. To be sure, a smaller pile could be put into the pot, but this would probably bring the cost of annealing up so as to render it objectionable.

## A Refractory Furnace Lining.

For certain purposes, a furnace lining of a refractory nature may be made from asbestos and water-glass. It is useful for patching or plugging cracks as it does not crumble as readily as other similar compositions made from clay.

The material is made of the following:

| | |
|---|---|
| Fine Asbestos .......... | 40 lbs. |
| Water-Glass ............ | 60 lbs. |

The water-glass is the same as silicate of soda and occurs in commerce as a jelly like mass which is soluble in water. The asbestos and water-glass are mixed with enough water to make the whole pasty so that it can be worked.

## The Bright Dipping of Brass.

The bright dip for brass has long been known, and it may be said that there has been no improvement in it for a hundred years. The dip remains the same to-day as it did then.

The object of the dip is to produce a bright and uniformly clean surface upon brass goods of all kinds and it is employed for a very large variety of small work which could not be buffed on account of its cost. It is also used for producing a bright and clean surface on larger articles which are to be otherwise treated.

When one uses care, bright dipping is not a difficult operation, but attention must be given to certain preliminary operations; otherwise, no matter what the nature of the dip is a good surface cannot be obtained. The things necessary to look after in dipping brass in the bright dip and which are preliminary operations are as follows:

1. The brass to be dipped must be free from grease or oil. If not, the dip will not act evenly. It is equally as essential that the brass goods to be dipped shall be free from grease or oil as it is for electroplating.
2. Scale or oxide must previously be removed from the brass goods. Brass which has been annealed and consequently has scale on it, or that which is corroded cannot be dipped bright in the bright dip without previously removing the scale, oxide or corroded spots. This, as subsequently will be explained, can be removed by an acid pickle or dilute sulphuric acid.
3. The goods to be dipped must be dry. It is a frequent error in dipping brass goods to dip them without drying them. The dip will then not only work unevenly but will gradually become diluted and pit the brass. All work must be dry before going into the dip.

The removal of the grease and oil is accomplished by means of potash, caustic soda, soaps or the other cleaners used for preparing work for electroplating. After the work has been cleaned, rinse it in cold water to remove the cleaning solution which adheres to it, and then into hot water and dry. Frequently the work will dry off itself from the heat, but if it is of such a character it will not, then sawdust or heat must be employed. It is then ready for the dip.

If the brass goods have been annealed or are corroded, then a sulphuric acid pickle must be used for the reason that the bright dip will not remove the scale or corroded spots. All it will do is to brighten the surface. Pickle the goods, when they are in the condition previously described, in the following mixture of sulphuric acid and water:

| | |
|---|---|
| Water .................... | 9 gallons |
| Sulphuric Acid .......... | 1 gallon |

It should be borne in mind that oil of vitriol and sulphuric acid are the same. Pour the acid *into* the water and stir with a stick of wood. If used warm or hot it works more rapidly than when cold, although it will work equally as well, although more slowly, when cold. Immerse the goods to be pickled in it until the scale has been removed, which may take from five to ten minutes depending upon the depth of the scale, then rinse in cold water thoroughly and finally in hot water and dry. The goods are then ready for dipping.

**Dipped Brass Article.**

To obtain a uniform bright dip, the brass goods should be thoroughly dry. If any water adheres to them, streaks and spots will appear on the surface after dipping and the dip will also become diluted so that it will act on the work and pit it. Water in the dip will cause it to act on the brass too energeti-

[illegible] and a rough pitted surface will follow. It will be realized, therefore, that to obtain good results in bright dipping, the brass goods should be free from water.

The bright dip is composed of sulphuric acid (oil of vitriol) and nitric acid (aqua-fortis) to which is added a little common salt. The proportions of the two acids may be varied for different classes of work. If a very smooth acting dip is desired, then the sulphuric acid can be in excess, but if a more energetic dip is desired, equal amounts of each can be used. The first is used for sheet metal goods, and the latter for castings.

The dips are made in the following manner:

*Dip for Sheet Brass etc.*

| | |
|---|---|
| Sulphuric Acid, 66° ........... | 2 gallons |
| Nitric Acid, 38° | 1½ gallons |
| Common Salt | 1 oz. |

*Dip for Brass Castings*

| | |
|---|---|
| Sulphuric Acid, 66° | 2 gallons |
| Nitric Acid, 38° | 2 gallons |
| Common Salt | 1 oz. |

The following points should be noted in regard to the acids. The sulphuric acid is the commercial oil of vitriol and is the grade known as 66 degrees, or the strongest manufactured commercially. The nitric acid is the well known aqua-fortis and it is not the *strongest* acid manufactured. In fact it is the weakest. It has been found that if the nitric is too strong or the grade known as 42 degrees, the dip does not work as well. It is then necessary to add a little water to it. Some platers prefer to use the 42 degree acid and add water to it to reduce it, and perhaps this is the cheapest method, but the use of the 38 degree acid will usually obviate it. In case the dip does not work rapidly or "bite" sufficiently, a little water may be added to it, but very little or it will work too energetically and pit or rough the surface of the brass goods. Just bear in mind that a little water may make the dip work smoothly and evenly, but if too much is used the other extreme is obtained. With the 38 degree acid, it will usually be found that no water is necessary.

To make the dip, the following directions should be followed: Place the nitric acid in the stone crock to be used for the dip and then add the common salt to it. Stir with a stick of wood and then, little by little, with stirring, add the sulphuric acid. Heat will be generated. Mix well and allow to cool down a little for use. In adding water to the completed dip, in case this may be necessary, do not add it to the dip direct, but pour it into a pitcher in the bottom and then add a little of the dip *to it*. This will mix it. Then add the acid to the main portion of the dip.

*Red, Yellow and White Nitric Acids*

Three kinds of nitric acid or aqua fortis are known commercially: Red, yellow and white. The red and yellow acid are easily made from the white variety. The difference between the red and yellow and the white kind is that oxides of nitrogen are contained in the red and yellow and the white is the pure acid. White nitric acid soon changes to yellow upon exposure to the light. The red acid is made by adding various substances to the yellow acid and which will produce the red oxides of nitrogen in it. Among the substances that will accomplish this is "soot" and this is considered the best material for the purpose. It is extensively used for this purpose. It is generally considered that the red nitric acid (it can be obtained in commerce) is preferable to the other kinds for the dip, but it can easily be made from the yellow by means of soot. The white acid is not found in commerce, except in chemically pure material, for the reason that it changes to the yellow acid when exposed to the light and very rapidly when exposed to the sunlight.

*Use of Soot*

Soot is extensively used in the brass trades for generating the oxides of nitrogen in the dip and is efficacious. It is not the ordinary kind, but is that obtained from the burning of hard wood. It resembles soft coal more than anything else and has a shining lustre and occurs in lumps. The method of using it is to throw it on the dip after it has been made up and stir. Allow to remain over night and skim off the residue which will be white and small. It will be found that the dip will give a brighter surface to the brass when the soot is used.

*Difficulties*

Some of the difficulties encountered in using a dip are as follows:

1. Black spots are left on the surface of the brass after dipping. This indicates that the dip does not remove the scale or oxide on the surface. A sulphuric acid pickle is neces-

sary for this purpose, as previously mentioned, for removing the oxide or scale before dipping.

2. The brass comes out of the dip in a clean but spotted condition. Frequently streaked. This difficulty is caused by the work being wet when it goes into the dip.

3. The surface of the dipped brass is rough although bright and the dip acts violently. The cause is the presence of too much water in the dip. A good dip will act on the brass as soon as it is immersed, but the action will then stop in a few seconds. If it continues to act, it indicates too much water.

4. The dip acts on the brass but it does not come out bright but has a dull appearance. Too much common salt is frequently the cause of this difficulty as well as the use of nitric acid that is white or only slightly yellow. Use soot in the dip and this will cause it to give a bright surface to the dipped brass.

5. In dipping castings, black spots will frequently be found on the dipped surface. These are caused by the lead or tin separating out from the casting itself and which turn black in the dip. There is no remedy for this as the dip is not at fault. Better castings will have to be obtained, or those free from lead or tin. The best dipping metal is that which contains none at all or very little lead or tin.

6. The dipped surface has a mottled appearance. This frequently indicates too much sulphuric acid. This kind of surface is easily recognized after a few trials. The surface is not uniform although bright and clean.

7. The dip does not act rapidly or well. When this is the case, it is probable that the dip is too cold. The best results are always obtained in dipping when the dip is slightly warm. After it has been used a while it usually warms up, and in summer it frequently is at the right temperature, but in winter it should always be warmed. A temperature of from 120 to 150 degrees F. is excellent. It will be surprising how much better a warm dip will work than a cold one, and in many instances, the whole trouble with a poor working dip is the fact that it is too cold.

## A Modified Electrogalvanizing Process.

A modified electrogalvanizing process has recently been patented by Sherard O. Cowper-Coles of London, England, the well known inventor and patentee of the process of zinc coating known as "sherardizing". This process consists of first depositing a coating of iron on the iron or steel surface electrolytically and then afterwards depositing a coating of zinc or an iron and zinc alloy. It is claimed that the preliminary coating of iron acts beneficially, and as it is slightly electro-positive to the underlying metal, serves to protect it. The process is described by the inventor as follows:

"My invention relates to an improved process for protecting iron and steel surfaces from corrosion.

According to my invention, I proceed as follows: That is to say, I first remove all scale, grease and oxide from the articles to be treated, in any of the well known manners, such as by pickling or sand blasting, and I then electro-deposit upon them a coating of iron as pure as possible. The iron may be deposited from any suitable electrolyte, for example, ferrous sulphate. The articles after having been coated with pure or practically pure iron, are washed and then placed in a second vat, in which a coating of zinc or zinc-iron alloy is deposited upon the pure iron.

I would here remark that a thin coating or film of chemically pure iron has been suggested by other workers as a basis for the deposition of metals such as tin, nickel and copper, but whereas they deposited a film of iron, with the object of increasing the adhesion of the metal subsequently to be deposited upon the iron, I cause a comparatively thick coating of pure iron to be deposited upon the iron or steel, which deposit, being slightly electro-positive to the underlying metal, acts in itself as a protective coating. In fact, in many cases, the amount of iron deposited exceeds the amount of zinc or zinc-iron alloy subsequently deposited thereon.

In a modification of the invention, I may advantageously effect the deposition of both iron and zinc or zinc-iron alloy from the same electrolytic bath, which is made up of a mixture of zinc and iron salts. When this procedure is adopted, a low current density is employed in the first instance, so as to deposit iron, and toward the end of the depositing process, the current density is increased, in order to deposit a zinc-iron alloy. The electrolyte is made up with iron and zinc sulphates, about 20 ounces of the crystallized salts of each metal to each gallon of water. Insoluble anodes are employed in conjunction with lead or iron anodes, and the electrolyte circulated over scrap zinc in order to keep the zinc content in the electrolyte the same. The relative proportions of zinc and iron in solution are varied according to the current density it is desired to employ, which varies with the class of work to be plated, whether flat work or work having deep recesses. The current density usually employed ranges from 5 amperes to 20 amperes or more per square foot of cathode surface.

In some cases the articles may finally be subjected to a heating or baking process to effect a closer union of the deposits with the surface of the articles."

## Making a Lead and Sodium Alloy.

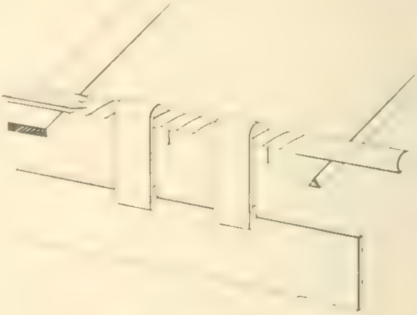
A method of making a lead and sodium alloy directly from metallic lead and caustic soda has been patented by E. C. Rossiter of the British Cyanides Company of London, England. The lead is melted in a covered iron pot to which is fitted an agitator. The caustic soda is heated in another pot to drive off the moisture from it, after which it is transferred, together with charcoal, to the molten lead. The sodium is reduced and combines with the lead to form a lead and sodium alloy. One kettle may be used for the process in the following manner:

Five hundred pounds of caustic soda are fused in the iron pot provided with the agitator and cover. Coal gas is passed in later so that the pot must be provided with a pipe for this purpose. From 400 to 600 lbs. of metallic lead are now added and the pot is heated to a temperature of from 600 to 700 degrees C. in a slow current of the coal gas until all moisture is driven off from the caustic soda. Sixty pounds of dry charcoal are now added to the pot little by little and the heating allowed to continue. A vigorous evolution of gas follows and the sodium is reduced from the caustic soda and alloys with the lead to form a lead and sodium alloy. The reaction is allowed to continue and the heat raised to about 750 degrees C. until the evolution of gas becomes less vigorous. Finally there is obtained a lead and sodium alloy in the bottom of the pot and a layer of semi-fused sodium carbonates about it. The sodium carbonate can be used for other purposes or converted into caustic soda for further production of the lead and sodium alloy.

An alloy of lead and sodium is used in the manufacture of cyanide of soda.

## An Improved Form of Anode or Work Rod.

In electroplating it is customary to use a round rod or tube for holding the anode or articles to be plated. An improved rod for this purpose has recently been patented by Peter Jensen of Perth Amboy, N. J. An angular rod is used and it is twisted, as shown in the illustration, so that a series of sharp edges are presented. It is claimed that such a rod is easier to keep clean and a better contact is obtained.



New Form of Anode Rod.

## Erratum.

### "Bristol" Electric Furnaces for Heating Soldering Irons.

In The Brass World for June 1913, page 219, the Bristol Electric Furnaces for heating soldering irons were described. In this article it was stated that "The furnaces are quite expensive". This sentence should have been "The furnaces are quite *inexpensive*" as they are comparatively cheap.

## Some Chemicals Used in Electroplating.

### Phosphate of Soda.

Phosphate of soda is a chemical not extensively used in electroplating, but, nevertheless, it is a valuable substance for the purpose for which it is employed. It has but one use in the art of electroplating and that is as a conducting salt. It is an excellent conductor of electricity when in solutions which are deficient in such a property.

Phosphate of Soda.

Phosphate of soda, while an excellent conductor of electricity, seems to be inert, as far as action upon the anode or upon the deposit is concerned; and it is on this account that it is so valuable as a conducting salt.

There are a number of kinds of phosphate of soda, but the one in general use and which is employed in electroplating is the so-called *tri-sodium phosphate* or *normal sodium orthophosphate.* The other sodium phosphates, with the exception of the sodium phyophosphate, are not employed in electroplating. Sodium pyro-phosphate is used in electro-tinning.

At the present time, the use of phosphate of soda in electroplating is confined to gilding and it is this line of work that it is so useful as conducting salt. In the usual gold plating bath, there is so little gold and so little cyanide used that it is deficient in conductivity. By employing phosphate of soda, therefore, it is possible to increase the conductivity without any other action upon the gold deposit or upon the anode.

Phosphate of soda (tri-sodium phosphate or common phosphate of soda) occurs in commerce in white crystals of a semi-transparent nature which, upon exposure to the air, become opaque but still white. It is possible that phosphate of soda may be employed in increasing the conductivity of other plating solutions although, as far as known, no use in any solution other than gold has been made of it. Phosphate of soda is not poisonous.

## Chloride of Aluminum as a Flux.

According to a French periodical, anhydrous chloride of aluminum is a good flux for use in melting aluminum chips and other finely divided scrap. It is stated that when chips or filings of aluminum are melted alone, there is obtained less than 30 per cent. of metal. By using chloride of aluminum as a flux, from 50 to 60 per cent of metal is obtained.

The chloride of aluminum used must be what is known as anhydrous. The ordinary chloride of aluminum contains water and cannot be used successfully.

## A New Aluminum Alloy for Rolling.

A new aluminum alloy for rolling into sheet or drawing into wire has recently been patented by William A. McAdams of Bayshore, N. Y. It is claimed that the proportions of metals in the alloy should be as follows: The aluminum to be five times that of the zinc and the zinc five times that of the copper. These proportions give the following percentages:

| | |
|---|---|
| Aluminum | 80.65% |
| Zinc | 16.13% |
| Copper | 3.22% |

It is claimed that the alloy will roll into thin sheet and may be manipulated in order to make various articles.

## The New "Brown" High Resistance Electric Pyrometer.

For measuring high temperatures, it is believed that no form of pyrometer is so satisfactory and accurate as the thermo-electric instrument, which consists of a thermocouple and a milli-voltmeter, graduated in degrees. The desirability of having the resistance of the milli-voltmeter comparatively high has been a recognized fact, but it was not until recently that the art of electrical instrument making was able to overcome various difficulties and produce such an instrument.

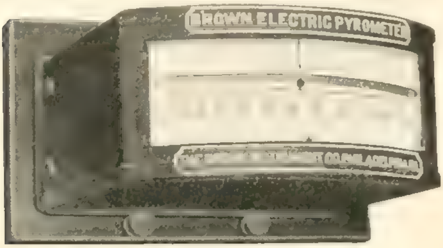


Fig. 1. Standard Type of Indicating Instrument.

For this reason, low resistance thermo-electric pyrometers have been very generally used and the resistance of the milli-voltmeter measures from 2 to 5 ohms. With such a form of instrument it is essential that it be calibrated with the leads which are to be used and any change in the length of the thermocouple will alter the true reading of the pyrometer. A change in length of leads from 1 to only 50 feet is sufficient to make the average low resistance pyrometer read 25 degrees or more low and when the length is increased from 3 to 4 feet the error will be 20 degrees.

It is true that galvanometers or milli-voltmeters, portable in form only, have been produced abroad. These instruments, however, are of the suspension type so that the moving element is suspended by a fine wire. This renders the instrument very delicate and the suspension is easily broken. It is also necessary to level the instrument or the coil will not swing freely. Such a type of instrument, therefore, is unsuited for commercial work. The advantages, however, to be gained from a properly designed or constructed milli-voltmeter or high resistance are very marked and any change in the length of the leads from 1 to 1000 feet will not change the readings of the instrument, even as much as 5 degrees, nor will any change in temperature of these leads introduce an error. All these advantages are entirely due to the extremely high ratio of the resistance of the milli-voltmeter, in relation to the resistance of the thermo-couple and leads.

The Brown Instrument Company of Philadelphia, Pa., the well known makers of pyrometers and electrical instruments, have been conducting experiments on the subject of pyrometers which have extended over a number of years with the result that they can now supply a pyrometer with an instrument for measuring of the pivot type and having a resistance of 100 ohms. It can be supplied either in the indicating or recording type. In Fig. 1 is shown the standard type of indicating instrument and which is horizontal in order to supply a long scale for accurate readings. In Fig. 2 is shown the interior construction of the high resistance system with the re-designed pole pieces.

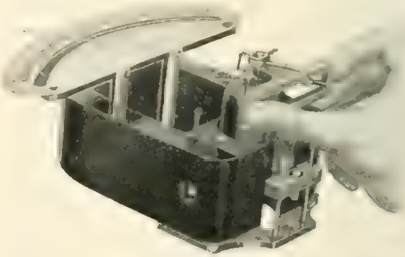


Fig 2. Interior Construction of the Instrument.

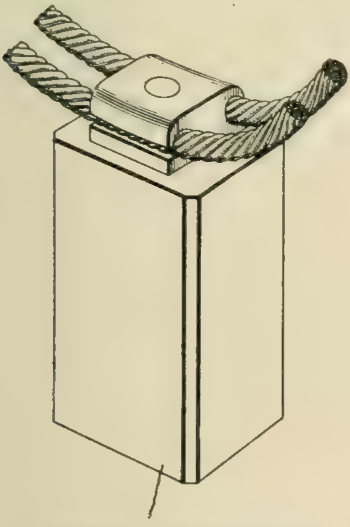
It will be understood that with this new type of pyrometer, greater accuracy can be obtained and that the length of the leads has no appreciable bearing on the readings. The cost of the instrument, too, is practically no greater than the low resistance instruments. Base metal or platinum or platinum thermocouples can be used.

Iron can exist in brass or bronze in two conditions: First, in the combined or alloyed condition. This means that the brass is uniform throughout and that the iron has alloyed with the other metals completely. There are no hard spots in such brass. Second, uncombined iron. In this condition the iron exists in the shape of shot or nodules which are very hard. They ruin the tools when such brass is cut.

## Graphite and Bronze Motor Brushes.

The incorporation of graphite with bronze or other metal, for use as motor or dynamo brushes, bearings or other similar purposes, has always been an attractive matter and many unsuccessful attempts have been made to manufacture suitable compositions of this kind. The material thus obtained, however, has usually lacked the necessary strength and homogeneity.

A new method of making a motor or dynamo brush of graphite and bronze has recently been patented by Emery G. Gilson of the General Electric Co. of Schenectady, N. Y. It is claimed that by this method used a very solid and homogeneous mass is obtained which will have the combined properties of graphite and bronze. The following method is used in the manufacture of the brush:



Bronze and Graphite Motor Brush.

The graphite is mixed with oxide of copper and oxide of tin in the following proportions:

| | |
|---|---|
| Graphite .............. | 125 parts |
| Copper Oxide ........ | 100 parts |
| Tin Oxide ............ | 10 parts |

The three ingredients are mixed and ground in a ball mill and placed in a retort, preferably of copper, and heated to a temperature of from 650 to 700 degrees C. for about 8 hours. Most of the oxides will then be reduced on account of the reducing action of the graphite. Upon cooling, the mass is put through a 100 mesh sieve and is compressed into the form desired. This operation of compressing is conducted by a hydraulic press or other similar means.

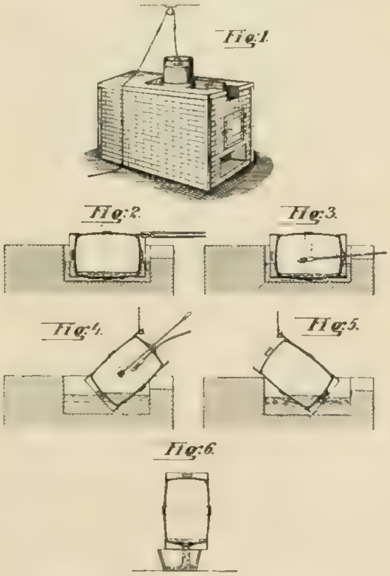
The brush blocks now formed are packed in charcoal and again heated to a temperature of from 650 to 700 degrees C. for about 60 hours and then provided with a suitable electric connection.

Articles thus made are somewhat porous and capable of absorbing as much as 5 per cent. of oil. This oil absorption is of great advantage in some instances.

Motor or dynamo brushes produced in this manner are of great advantage in many kinds of motors and generators, notably those of small size or which are used in the electric starting of automobiles. The combination with the graphite gives the bronze a lubricating quality which obviates any attention.

## Improvement in Tinning.

The use of tin for tinning vessels to contain food, or other substances which corrode iron or steel, is quite necessary as other metals, such as lead or zinc, while they protect the base metal, are acted upon by the food or other substances. A German inventor has recently invented a process for tinning the inside of steel casks and which he has patented.



Method of Performing the Tinning.

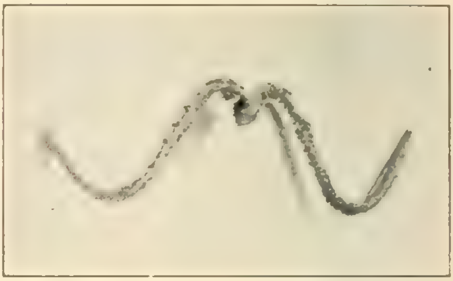
The ordinary method of tinning such casks is to melt the tin inside by means of heat applied to the outside. According to this invention a bath of melted zinc or lead is used to heat the cask and melt the tin on the inside. The method used may be understood from the illustration herewith shown.

The bath of molten zinc or lead, which melts at a much higher temperature than the tin, serves to heat the tin on the inside of the steel cask in a uniform manner without causing it to become overheated and oxidized as in the case of a direct heating of the outside of the cask by a flame. In addition, it is claimed that the outside of the cask is coated with the zinc or lead, as the case may be, at the same time the inside is covered with the tin. The tinning is carried out in the usual manner inside of the cask. The tin is placed inside previous to heating and a small quantity of chloride of zinc is used with it for a flux. A long handled brush as shown in the illustrations, is used to spread the tin and flux as may be necessary.

## Effect of Sediment in Nickel Plating Solutions on the Deposit.

In nickel plating the anodes do not dissolve wholly, but there is left a slime upon the surface. This slime, of course, is always metallic and at first adheres to the surface of the anode and then finally separates and floats about in the solution. In a nickel solution that has been used for some time, a large quantity of this metallic sediment will be found in the bottom of the plating tank.

This sediment consists of metallic particles of nickel, with some iron, tin, carbon and traces of other metals which may be in the anode. It has been a general belief that such sediment in a plating solution is harmless and so it is if allowed to settle to the bottom of the solution and remain there. If the solution is stirred, so that the particles remain suspended in the solution, they become injurious. Non-metallic particles, such as ordinary dust and dirt are not particularly harmful as they do not adhere to the work being plated unless it is flat and they actually settle upon it, but in the case of metallic particles, the matter is quite different. Fine metal particles in a plating solution seem to be attracted by the work being plated somewhat in the same manner that a magnet attracts iron or steel filings. The particles attach themselves to the work being plated, forming a rough surface, pits or other imperfections after it has been plated with nickel. In the illustration, herewith shown, is shown a hook used on a rack in a nickel plating tank which has become quite rough on account of the adherence of the suspended particles in the solution to it.



Effect of Sediment in Nickel Solution on Hook.

The remedy for this difficulty is to keep the sediment out of the solution. The anodes must be cleaned off occasionally but it is well to do it at a time when the solution, which will be more or less stirred up by removing the anodes and washing of the sediment during their removal, will have ample time to settle. This can be done the last thing at night or on Saturday. A clear solution will then be obtained for plating.

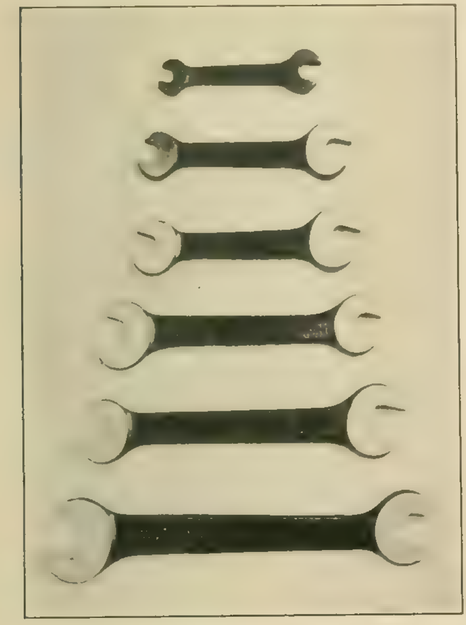
It is not practicable to filter a nickel plating solution, nor is it advisable. It should be allowed to settle and the bottom not stirred up. To bring this about to the best advantage, the plating tank should be sufficiently deep to allow room for the sediment at the bottom and prevent its becoming stirred up when work is put in or taken out.

In melting silver, a covering of some carbonaceous material, such as charcoal should be used. This protects the melted metal from the products of combustion of the fuel and supplies a reducing action on its surface, effectually preventing the absorption of oxygen. Oxygen, as well known, is absorbed by molten silver and is expelled again upon cooling, forming blowholes or pinholes.

## Use of Black Lacquer on Steel Tools.

Black lacquer has come into quite extensive use within the past few years and has proved to be a very serviceable material for many classes of work. It produces a black finish that is quite durable and exceptionally pleasing in appearance.

One of the recent applications of this material is in finishing of steel tools, such as the wrenches herewith illustrated. Previous to the use of this black lacquer, it was customary to leave the wrenches with a case-hardened surface or an oil black surface, both of which are more expensive to produce than the one obtained by the use of black lacquer. To be sure, the oil or case-hardened finishes are still used, but they are more expensive to produce than the lacquered surface, and as they are used for appearance only, the lacquer is equally as good and much cheaper. The lacquer may be applied to the article after the forging has been made and what machine work that is necessary has been done upon it. The brush is the best method of applying the lacquer.



Steel Wrenches with Black Lacquer Finish.

Tools finished in this manner have a very attractive appearance and the lacquer is quite durable, too, after they have been put into use as oil has no effect upon it.

## An Improvement in the "Bontempi" Rust-Proofing Process.

The "Bontempi" process of rust proofing is an improved method of "Bower-Barffing" iron or steel and consists of heating it to a red heat in a muffle and then passing in steam together with the fumes of zinc or a heavy hydrocarbon like tar or pitch. A black, rust-proof coating is produced on the iron or steel surface and can be made more or less heavy, depending upon the length of time consumed in the heating.

Agusto Bontempi of the Bontempi Rust Proofing Co. has recently patented an improvement on this process by which the formation of the black coating is expedited and the formation of a red coating is prevented. The operation is carried out as usual in a muffle furnace, the construction of which is shown in Figs. 1 and 2.

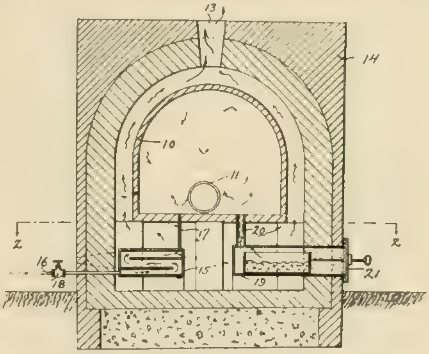


Fig. 1. Upright View of the Furnace.

When treating iron, the desired effect is obtained by heating the same to approximately from 900 to 1200 degrees F. in a muffle chamber to which is led the fumes of a fused non-corrodible compound or substance which condense in a fused condition at this temperature. The compounds used fume at a temperature of approximately 1400 degrees F. so that the fumes from them condense rapidly upon the articles. Before subjecting the iron to these fumes, it may be treated with superheated steam, and this is advantageous with heavy articles, but may be omitted with light articles. Where steam is employed, lime may be introduced into the muffle to facilitate the formation of the rust-proof coating by "catalytic" action. Naptha or other hydrocarbon may be injected with the steam to impart a black color to the surface.

In the form shown, the apparatus consists of a muffle chamber 10 of fire-brick within which the article 11 is under treatment. This muffle is heated by burners 12 around the space beneath the muffle. The products of combustion pass around the muffle and escape at the outlet 13 at the top of the casting 14 of fire-brick and asbestos. Beneath the muffle and adjacent the burners I arrange for the sake of economy a steam box 15 in which the steam coming from any suitable source through the pipe 16 is superheated before introduction through the pipe 17 into the muffle chamber. A valve 18 controls the inlet for the steam. On the opposite side of the furnace I have arranged a retort 19 in which are placed the substances comprising the rust proofing material. The latter is fused by the heat from the burners and the fumes pass up from the retort through the pipe 20 to the muffle chamber. A door 21 is provided for the retort chamber through which the chemicals may be introduced.

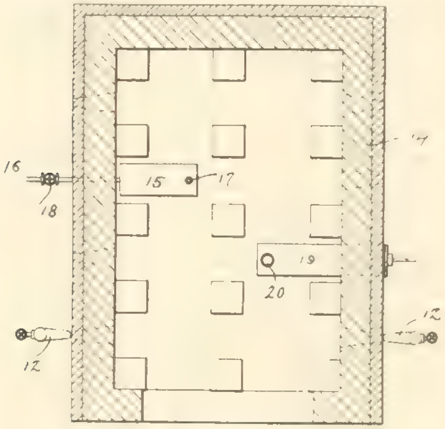


Fig. 2. Plant View of the Furnace.

Where treatment by steam is not to be used in any particular case the articles to be treated are first heated by placing them in the muffle and starting the burners. As soon as a suitable temperature has been secured in the muffle chamber the rust proofing material is placed in the chemical retort, where it is rapidly heated to a temperature of 1400° F. or higher and the fumes rise from the fused material to the muffle chamber and rapidly condense upon the articles therein. If the articles are to be first heated by steam, however, the cock 18 is opened and the steam passing through the steam box 15 enters the muffle chamber superheated to a temperature of 1400° F. or above. After the steam has been in contact with the articles a sufficient length of time, the cock 18 is closed and the temperature of the chamber soon drops to 1200° F. or less. The chemicals are then introduced into the retort 19 and after the fumes thereof have filled the muffle for the desired length of time, the heat is cut off and the muffle permitted to cool sufficiently to allow the withdrawal of the articles under treatment.

As examples of non-corrodible material suitable for use in this process, I may use, (1) tannic acid, an oleaginous material and a non-corrodible material such as zinc or an oxide of such metal; or (2) a pure metal such as zinc or lead, or (3), substantially solid hydrocarbon such as coal tar or pitch. The first of these materials gives a good coating a dark gray color; the second gives also a good coating a blue color, while the third gives a black coating of the very highest quality.

Before the treatment, the metal is washed perfectly clean, as usual, in rust proofing processes. After the goods are taken out of the muffle they are cooled to about 100° F. and greased with vaseline and [illegible] so as to give them a good polish and an attractive appearance.

## Use of Aluminum for Precipitating Silver from Cyanide Solutions.

At the Nipissing mine in Cobalt, Ontario, it is stated that aluminum powder is used for precipitating silver from cyanide solutions. It is used in conjunction with caustic soda. It is stated that it does not foul the solution like zinc and is not influenced by the presence of arsenic. It is also twice as effective as zinc.

The same kind of apparatus is used as that employed with zinc, with the addition of mechanical stirring apparatus. The aluminum in the form of powder of the required fineness costs about 39 cents, but on account of its effectiveness, it is considered cheaper than zinc dust at 7 cents.

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The ordinary so-called "spelter solder" is composed of equal parts of copper and zinc, granulated into grains while hot. It is used for brazing copper, iron or steel and brass.

## Making Cartridges in the Chinese Military Arsenal at Te Chow.

In the *Daily Consular and Trade Reports* a description of the arsenal at Te Chow is given. The following is the part of the article devoted to the manufacture of the cartridges:

There are two separate and distinct cartridge factories. The 7.9-millimeter factory was built in 1902, and the 6.5-millimeter factory at a later date. Each factory has its own brass furnaces, annealing ovens, and rolls, and each its own machine shop for making tools, dies, etc. Each factory employs approximately 300 hands, and each produces 25,000 complete cartridges per day of nine hours. However, as the Chinese military authorities have decided to discontinue gradually the manufacture of the 7.9-millimeter rifle, the output of 7.9 cartridges will also be diminished, and some of the machines in that factory will be altered to make the small-caliber cartridge.

Most of the cartridge-making machines and machine tools in the older factory bear the name of Ludwig Loewe, of Berlin, though many of these are clearly not of Loewe's own manufacture. The equipment of the newer (6.5) factory is principally labeled "Schuchardt & Schutte, Berlin. A number of machines in each factory have been built in the general machine shop attached to the arsenal, such machines being usually merely copies of imported machines. These homemade machines include 25 or 30 of the small presses used for punching disks from bars and for drawing out the brass cartridge case, 6 double machines for reducing the neck of the shell, and several machines for closing the neck upon the bullet. One type of locally built machine sows some originality. This is a small furnace for annealing the completed shell before loading, in which several Bunsen gas jets are directed upon a revolving table which is fed and emptied automatically.

Each factory has three cartridge-loading machines, of which only one was imported, the other five (exact copies of the first) having been built in the local shops. The original machine is of Japanese manufacture and a copy of a German model, but the homemade machines appear quite as good as the original, and are surprising evidence of the mechanical skill of Chinese workmen, not only because of the complexity of the machine but also because of the perfect accuracy and fine adjustment essential to its successful operation. Each of these machines turns out 55 loaded and capped cartridges per minute.

The most notable deficiency in both factories is the lack of conveying apparatus and of machines for gauging the cartridge case and finished cartridge. There are automatic weighing machines which reject overweight and underweight finished cartridges, but aside from these all gauging is done by hand, about 10 per cent of all the employees in the factory being so occupied. Bars are conveyed to and from the rolls on hand trucks, but all similar materials are carried in boxes from machine to machine by coolies. Moreover, some rearrangement of the machines is needed to permit of a steady flow of materials through the factories. The chargers (or clips) for both sizes of cartridges are filled by hand, and then packed by hand into pasteboard boxes before being cased. There is no heating apparatus in the factories, with the result that at the time of the writer's visit in February some of the finer machines were running badly, owing to the oil thickening upon them.

Every part of a complete cartridge is manufactured in both factories. Copper primers are pressed and charged with fulminate; steel jackets for bullets are manufactured, and lead wire for the interior of the bullet is drawn from machines in the works. The cardboard boxes for packing the finished cartridges are made here, and even the cardboard is manufactured locally in the powder factory.

## Zinnoid.

A sheet metal called "Zinnoid" has made its appearance in Germany and the name would seem to indicate an alloy which contains tin. As a matter of fact it is simply sheet steel. It is made by Rozert Zinn & Co., of Barmen-Ritterhausen, Germany and is used for drawing and stamping.

"Zinnoid," as it is called, is a special grade of steel which can be supplied in an endless strip in all gauges down to as thin as .002 in. The material is such a soft quality that by by the employment of suitable tools it can be worked as easily as brass for the production of the thinnest and smallest articles. The material is suitable alike for stamping and drawing, and the articles produced can, of course, be finished in various styles to represent brass or other metals.

# Questions and Answers.

QUESTION No. 1362. Can you suggest a soft metal, from which to cast a lamp base or portable, that will come out of the mold without pores? We have tried coffin-hardware metal, but it gives a porous casting.

*Answer.* Your difficulty is not with the metal but either with the mold or method of pouring. It is possible to obtain as good castings with coffin-hardware metal as with any metal. Perhaps you are not pouring at the right heat, or your mold is not in a good condition.

QUESTION No. 1363. We have a call for some "dead" nickel plating and would like to know how we can do it. It is upon steel work, and we have never done any before.

*Answer.* In order to obtain a dead nickel deposit you will have to obtain a dead surface on the steel to be plated. The best way of doing this is by means of a sand blast. Then nickel plate in the ordinary manner. You will have to use a good, clean working nickel solution as the work will have to be left as it comes from the bath and cannot be buffed. Use about 2 oz. of boracic acid to each gallon of solution as this will give a white and clean nickel deposit. Another way to obtain the dead nickel is to give the steel a cyanide copper deposit and then a heavy acid copper deposit to obtain a matt or dead surface. Then nickel over this dead copper and the nickel will be dead.

QUESTION No. 1364. What mixture of metals would you recommend for a bronze composition to withstand electrolysis in portable water? Is there anything better than the standard bronze which we are using and which is composed of the following:

| | |
|---|---|
| Copper | [illegible] |
| Tin | 5% |
| Lead | 5% |
| Zinc | 5% |

*Answer.* One bronze mixture seems to be as good as another, as far as the corrosion by electrolysis is concerned. The problem is one of electrolytic action between two dissimilar metals and the bronzes seem to all act alike.

QUESTION No. 1365. I am having trouble nickel plating die castings. They are coming with black streaks on them. I first give them a deposit of copper in a hot cyanide copper solution and then nickel plate them. Where is the cause of the difficulty?

*Answer.* Your trouble is in the cyanide copper deposit. You are not covering with it well otherwise there would be no black streaks. If you nickel plate the castings direct with the nickel there will be black streaks, so that this indicates that there must be some portions not covered sufficiently with the copper as there is no streaking when copper alone is nickeled.

QUESTION No. 1366. I have a lot of tin containing about 3 per cent of 18 per cent German-silver and would like to know what proportion of this tin I can use in a soft solder without injuring the solder to any extent?

*Answer.* We do not know just how much German-silver will effect solder noticeably but should say a very small amount on account of the nickel in it. Both nickel and copper thicken tin when melted and would affect the solder in the same manner. We doubt whether you could use 10 per cent. of the tin in making a half and half solder. You will have to ascertain, however, by trying. It would be preferable to use the tin in making bronze or brass castings as it could then be used "straight" without difficulty.

QUESTION No. 1367. We want a mixture for a heavy rolling mill bearing that we can call "phosphor bronze." These bearings are to be put in the rolling mill without any finish and just as they come from the sand and are cleaned. Can you give us a good mixture for this work?

*Answer.* The following mixture will be found satisfactory for this work:

| | |
|---|---|
| Copper | 79 lbs. |
| Tin | 10 lbs. |
| Lead | 10 lbs. |
| 10% Phosphor Copper | 1 lb. |

QUESTION No. 1368. Will you inform me whether the black lacquer that is so extensively used for automobile work will stand oil or gasoline? I want to use it on an article that will come in contact with kerosene oil and possibly gasoline and am afraid that the lacquer will be acted upon by them.

*Answer.* The ordinary black lacquer, as used in the automobile trade is not acted upon by oils or gasoline. This fact renders it possible to use it, otherwise it could not be employed for such a purpose. The pyroxylin base of the lacquer is the reason for this.

QUESTION No. 1369. In visiting an aluminum foundry, in which large aluminum castings for automobile work are made, I noticed that the large cores were dried by means of a torch. What is the advantage of this method? I should think it would be difficult to dry the cores completely.

*Answer.* Torch drying is particularly suitable for certain kinds of cores, particularly those to be used in casting aluminum. It serves to skin-dry them, leaving the interior green and with the result that they are more friable than a core dried clear through. As aluminum requires a weak core, it can be obtained in this manner. There is no other advantage and it takes more labor to prepare them in this way than would be the case when the cores were dried clear through.

QUESTION No. 1370. When the term "free cyanide" is used, what is meant by it?

*Answer.* The term "free cyanide" is used to designate the amount of cyanide that actually exists free in a plating solution and is not combined with any metallic salt. For example, in making up a silver solution with 3 oz. of silver per gallon, enough cyanide is first used to combine with this silver or dissolve it, and then 3 oz. more cyanide are added for free cyanide. It will be seen that this last cyanide exists free in the solution.

QUESTION No. 1371. Can an ordinary brass founder with his usual equipment make castings from Monel-Metal? I have an order for some castings in this metal and am afraid to make the trial as I will have to purchase the metal, and then, if I cannot melt it I will have it on my hands.

*Answer.* We fear that you will not be successful. Monel-metal is composed of about two-thirds nickel which renders it quite refractory and it melts at nearly as high a heat as pure nickel. The ordinary brass founders' furnace has natural draft and this is not usually sufficient to melt the metal. If you have a blast on your furnaces you will be able to melt the Monel-metal.

QUESTION No. 1372. What kind of a furnace is used for melting platinum? Is there an electric furnace made for this purpose?

*Answer.* Platinum is usually melted by means of an oxy-hydrogen blowpipe. A block of lime is hollowed out for the crucible. Nothing has been found which will take the place of lime for this purpose. There is an electric furnace made for melting platinum and is constructed for melting small amounts. It is made in Germany and called the "Hellberger" furnace. An alternating current is used.

QUESTION No. 1373. Is there much difference in fire-brick for crucible furnaces? We have experienced more or less difficulty on account of the fire-brick burning out rapidly and it has occurred to us that possibly some brands of fire-brick might be better than the one we are using.

*Answer.* There is a larger difference in fire-brick and some are not adapted for crucible furnaces. For crucible furnaces in which coke or coal is used, a fire-brick of the following qualities is necessary:

1. It shall have a smooth surface so that it is not easily broken off by the poker or starting bar, or clinkers will not adhere to it.
2. It shall have a fairly high fusibility.
3. It shall be of a basic character.

The basic character is the principal feature and if the clay, from which it is made is the high in alumina, the brick will have the desired basic character. The object of this feature is that the ash of the coal or coke is basic and if the fire brick is also basic there is no reaction and the clinkers will not adhere to it. With a brick of an acid character, the ash will react with it, fusing on and forming a slag which must be broken off. The result is that the brick is broken off with the slag. Ordinary fire brick is of this kind. A brick high in alumina is the best for crucible furnaces and is regularly made for this purpose.

QUESTION No. 1374. How is the finish on bronze statues obtained? Those of large size and found outdoors are the ones to which I refer.

*Answer.* The finish on such statutes is obtained by the use of a liver of sulphur solution. This has the property of coloring the bronze a brown tint, although it will cause copper to turn black. The bronze will have a good bronze color which finished although brownish in shade. The liver of sulphur solution if made by dissolving about an ounce of this substance in a gallon of water. It can be applied to the surface with a brush or other method and allowed to remain on until the desider shade is produced. It is then rinsed off with clean water, allowed to dry and then scratch brushed with a brass scratch-brush to bring out the lustre.

QUESTION No. 1376. We have been making some sheet brass for a maker of automobile lamps which he draws up in a press. He has had no difficulty in drawing the brass and we have never had any complaint from him before. The brass is a 2 and 1 mixture made from good spelter. Now he complains that the lamps are cracking after they have been in use for some time. From his description we should say that several months had elapsed before the cracking took place. It has occurred to us that it might be the compound used for cleaning the lamps that would cause this difficulty. We would be glad to have your opinion on the subject.

*Answer.* The cause of the difficulty is not the cleaning compound used on the lamps, but a phenomenon known as "season-cracking". All brass, whatever the purity of the metals, is subject to it if the conditions are right. The cause is in the press work. Imperfect dies or those not constructed right cause the outside of a brass shell to be drawn more than the inside, thus introducing strains in the metal. It is these strains that cause the cracking of the metal. It is a very common phenomenon and one for which the manufacturer of the brass sheet is in no way to blame. The remedy is to make the dies right. This trouble has already been exploited many times in the back issues of THE BRASS WORLD.

QUESTION No. 1377. What is the usual formula for silver solder,.

*Answer.* Ordinary silver solder, and one suitable for the majority of uses, is composed of the following:

| | |
|---|---|
| Silver | 2 parts |
| Brass | 1 part |

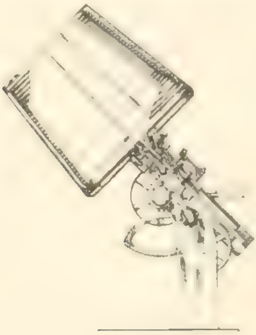
The brass is ordinary sheet brass composed of 2 parts of copper and 1 part of zinc. This is known as "drawing brass" sheet. The solder can be made by the addition of copper and zinc, instead of the brass if desired. The solder will roll itno sheet.

QUESTION No. 1379. Is sulphuric acid as good as boracic acid for adding to a nickel solution?

*Answer.* Sulphuric acid is not as good as there is danger of introducing too much. There is no danger with boracic acid it will not dissolve. It has been found that a better deposit can be obtained with boracic acid

## Patent Abstracts.

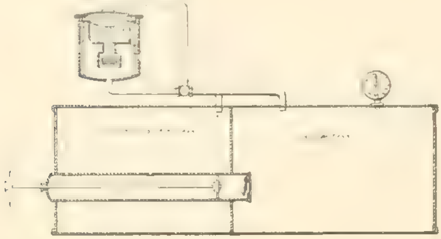
1,073,945, Sept. 23, 1913. TUMBLING BARREL. Frederick E. Warner of Bridgeport, Conn. An oblique tumbling barrel, the body of which consists of a coil of pipe in the shell of the barrel through which steam



can be passed for heating the contents. The coil is placed between the outer and inner shell.

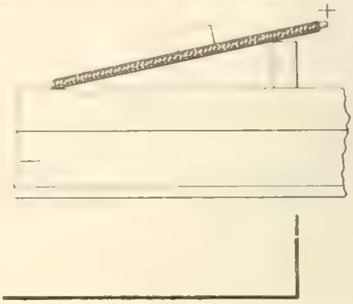
1,073,560, Sept. 16, 1913. SILICON ARTICLE. Thomas B. Allen of Niagara Falls, N. Y. Assignor to the Carborundum Company of the same place. A method of casting silicon so that it will be free from blowholes, solid, and free from "cold-shots". Also not as coarsely crystalline as when cast in the usual manner. The result is accomplished by the use of magnesium which acts as a deoxidizer. The magnesium is introduced into the molten silicon by means of a graphite phosphorizer.

1,072,738, Sept. 9, 1913. APPARATUS FOR CASTING METAL. Alonzo A. King of Painia, Cal. A pressure casting apparatus designed more particularly for small castings



such as dental work. The casting is forced into the mold by both pressure and a vacuum, thus insuring every portion filled with the liquid metal.

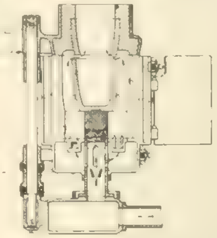
1,07[illegible]54, Sept. 16, 1913. ELECTROLYTIC DEPOSITION OF METALS BY FUSION. A. P. Strohmenger of Westminister, London, England. A method of depositing a metal in the fused state upon another so as to weld



to it [illegible]. The process is similar to electric welding except that the method is more like soldering. A rod of the desired metal surrounded with an asbestos covering, is fused by the arc formed upon the metal to be treated.

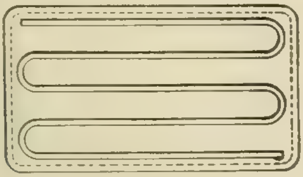
1,072,414, Sept. 9, 1913. REFRACTORY MATERIAL. Walter Arthur of Schenectady, N. Y. Assignor to the General Electric Co. of the same place. The material is a heat insulating material for electric furnaces, ovens, fireless cookers, or similar appliances. This material has a fibrous and fluffy nature and is made by heating silica, carbon and oxide of titanium in an electric furnace. It has a grayish or yellowish color and will stand a temperature of 1100° C. without change.

1,073,912, Sept. 23, 1913. CRUCIBLE FURNACE. Hans Koch of Dietikon, Switzerland. A furnace for melting metal in crucibles. It is formed in sections and so mounted that they can be swung into position around the



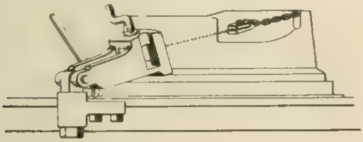
crucible and which also may be removed in the same manner so as to give an opportunity for taking out the crucible without the use of special tongs.

1,071,338, Aug. 26, 1913. DEVICE FOR CLEANING SILVERWARE. John Warne Philips of Chicago, Ill. A device for use in cleaning silver or silver plated ware from tarnish and stains. The process is an electrolytic one and the apparatus employed consists of a zinc plate for the base and a tinned-wire soldered to it throughout the surface and sides. The silverware is put into the device and a solution of common salt and bi-carbonate of soda poured in to set up the electrolytic action. When the operation is completed in a few minutes the ware is washed and wiped with a soft cloth and all tarnish will be found to have disappeared.



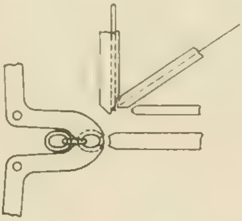
1,073,076, Sept. 9, 1913. METHOD OF TREATING METALS. James A. McLarty of Toronto, Canada. A method of treating metals for the purpose of rendering them rust proof. The metal to be treated is exposed to the vapor of a mixture of sawdust wet with water and coated with oil. The container holding this material is heated and the vapors, it is stated, cause the rust-proof coating to be formed. All metals, the inventor states, may be treated in this manner and it is given that bronze journals so coated give better results, as far as wear and running cool are concerned.

1,072,085, Sept. 2, 1913. WIRE DRAWING MACHINE. Elbert H. Carroll of Worcester, Mass. Assignor to the Morgan Construction Co. of the same place. The invention relates to means for supporting the die holder of a wire drawing machine in different positions. The method used may be understood from reference to the illustration.

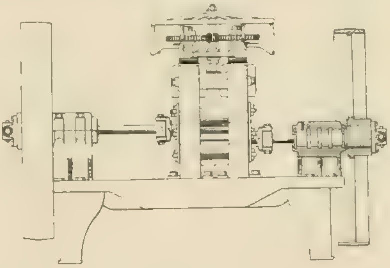


1,073,876, Sept. 23, 1913. CLOSED HOPPER SAND BLAST. George F. Stedman of St. Louis, Mo. A sand blast in which a single mechanism is provided for governing the sand-gate and the shut-off valve.

1,073,090, Sept. 16, 1913. PROCESS FOR THE MANUFACTURE OF SOLDERED CHAINS AND WIRE TISSUES FROM WIRE OF SOLID CROSS SECTION. Theodor Bürck of Pforzheim, Germany. The method used consists of providing a burr at the middle end surface of the wire, behind which the strip of solder is pushed. By means of a punch a piece of solder of the desired length is cut off the strip, the burr at the same time being forced against the end of the wire so that it clamps in place the piece of solder so that it cannot become lost during further treatment.



1,071,846, Sept. 2, 1913. ROLLING MILL. Frank A. Wilmot of Bridgeport, Conn. The invention relates to a rolling mill for cold or hot rolling and has for its object the production of greater uniformity in gauge of the rolled metal, especially in case of the thin gauges of sheet metal. Another feature is the production of rolls without necks and which may be hardened without difficulty. The rolls, it is stated, may be made smaller than usual on this account.



1,071,501, Aug. 26, 1913. BUFFING MACHINE. Harvey E. Barton of Attleboro, Mass. Assignor to the Freeman-Daughaday Company of the same place. The object of the invention is to insure a perfect evening of surface irregularities and a high and uniform degree of polish. The buffing is rendered entirely automatic and the buff wheel does not become hardened. The machine is intended for strips, wire, etc.

# Trade Items.

The Blum Fishman Company of New Haven, Conn., manufacturing jewelers, have filed a petition in bankruptcy. The factory has been located in the Poli Building. The liabilities are $1,708 and the assets $1,900.

An addition to the plant of the Sprague Meter Company, Water St., Bridgeport, Conn. is to be made. The addition will be 47 x 63 feet and one story high. Gas meters are manufactured by the company.

The Bridgeport Foundry & Machine Company recently incorporated in Bridgeport, Pa. will make both iron and brass castings. The capital stock is $30,000. The incorporators are B. F. Evans, J. J. McGuirk and J. C. Laird, all of Norristown, Pa.

The Leader Brass Foundry & Mfg. Co. has been incorporated in Cleveland, Ohio with a capital stock of $10,000 to engage in a brass foundry business and general brass working. Among the incorporators are H. W. Frecht and A. H. Meyer.

An addition is to be built to the plant of the Robert Jenkins Brass Company, 527 Colvin St., Baltimore, Md. The new equipment will be 10 brass melting furnaces and the output of the company will be increased threefold.

The Western Type Foundry Company of Chicago, Ill has purchased the property of the Wiebkind-Hardings Company, 1131 Newport Ave., Chicago, Ill. The capital stock of the Western Type Foundry Co. has been increased from $25,000 to $150,000.

The Bayonne Casting Company of Bayonne, N. J., founders in Monel metal, are filling a contract for the Isthmian Canal Commission for 150,000 Monel-metal high-tension insulators. W. E. Oakley, manager of the company is now in Panama on business for his company.

The sand-blast has now become such a useful appliance in the various metal trades that few manufacturers can afford to be without it. Leiman Bros., 62 John St., make special sand blasts for a variety of work and which are in use in a large number of establishments. Brass founders, silversmiths, electroplaters, glass manufacturers and many other manufacturers employ them as regular equipment.

The Oil Furnace and Engineering Company, 60 Liberty St. New York City, announce that they have so much business on hand at the present time that they have decided for a time to build nothing but large size furnaces of not less than 1000 lbs. capacity. They report that they have recently installed a number of furnaces for melting nickel and of 1000 lbs. to 10 tons capacity, copper scrap melting furnaces from 5 to 40 tons and a number of malleable iron furnaces. All these furnaces are using the natural draft burners made by the company.

A contract has been let for the erection of a new plant in Baltimore, Md. by the S. B. Sexton Stove Company. The plant will be 67 x 120 feet and wil cost $10,000. The location is at Conway and Little Green Sts.

A factory is to be established by the National Electric Sign & Construction Co., recently organized in Mansfield, Ohio with a capital stock of $50,000. Metal signs is to be one of the lines manufactured.

A new factory is to be built by the Gruen Watch Case Company of Cincinnati, Ohio. It will be located on Walnut Hills, near the factory of the Herschede Hall Clock Company. The size is 70 x 140 feet and will be composed of steel and concrete.

The Jackson Shear Company of Fremont, Ohio, manufacturers of cutlery, are to enlarge their plant by the erection of a new building 24 x 80 feet. The adjoining plant of the Fremont Furnace Co. has been purchased by this company and will be used for making shear castings.

The Lunkenheimer Company of Cincinnati, Ohio, manufacturers of steam metal goods, valves and lubricators, has purchased the property adjoining their plant and will erect a large brass foundry upon it. It is stated that the new foundry will be 150 x 350 feet and three stories high.

The Torrey-Eggleston Bushing Co. has been organized in Millerton, N. Y. with a capital stock of $40,000 and will manufacture trolley wheels, bushings, etc. A plant is to be established. The incorporators are F. B. Torrey of Richmond, Me.; L. J. Eggleston of Bath, Me. and D. J. Gleason of Millerton, N. Y.

The R. N. Bassett Co. of Shelton, Conn., manufacturers of corset hardware, eyelets, and supporter trimmings, have purchased the Worcester Metal Goods Company of Worcester, Mass. and will continue to operate it. Practically the same line of goods are manufactured by this company. D. W. Northrop of the R. N. Bassett Company has succeeded Edwin Brown as president and treasurer of the Worcester Metal Goods Company. This plant is located at 17 Hermon St.

The Standard Supply Company of New Haven, Conn. are now manufacturing the celebrated "Sopo" that is so satsfactory for burnishing metal goods by means of steel balls. It is very rapid in action and requires only two hours. It can also be used for tumbling metal goods without the steel balls but a longer time is then required. Free samples are supplied by the manufacturers. The "Platers' Cleaning Compound" made by this company has been on the market for 28 years and is a standard compound for removing buffing dirt. Two new electric cleaning compounds are now ready for the trade and inquiries are solicited.

The capital stock of the American Brass Foundry Co. of Milwaukee, Wis. has been increased from $5,000 to $12,000. It is stated that the plant is to be enlarged.

The Connecticut Electric Mfg. Co. of Bridgeport, Conn. are to manufacture a line of motorcycles and the patents for which have recently been purchased by the company.

The American Range & Foundry Company of Cleveland, Ohio, have discontinued the manufacture of stoves and are carrying on a jobbing business. An addition to the plant will shortly be made.

A foundry building is to be built by the Collinwood Iron, Brass & Aluminum Foundry Co. at 17,004 Waterloo Road, Cleveland, Ohio. It is to be 50 x 60 feet and composed of steel and concrete. The foundry will adjoin the present plant of the compony.

The National Manufacturing Company of Waterbury, Conn. have purchased a tract of land near that of the Waterbury Rolling Mill and will erect a plant for the manufacture of small seamless brass, bronze and copper tubing. The building will be 70 x 100 feet.

The Pottstown Machine Company of Pottstown, Pa. have recently built a machine for finishing valve bodies and which is novel in construction. It is intended for finishing valve bodies in one operation without additional chucking. The machine is of the turret type.

The Metal Arts Company has been incorporated in Rochester, N. Y. to manufacture jewelry and a factory has been started at 77 South Ave. for this purpose. The officers of the company are J. Jack, president; Arthur Rathyen, vice-president and A. Wahl, secretary and treasurer. Electroplating will be carried on and will be in charge of Mr. Wahl, who was formerly with Bastian Bros. of that city.

A large plant is being erected by the Standard Machinery Company of Providence, R. I. at Auburn, R. I., a suburb of Providence. The main building is to be 175 x 325 feet and a number of smaller buildings are to be erected. The manufacture of metal working machinery, such as rolls, presses and automatic machinery are made by the company. A specialty is made of machinery for the manufacturing jewelry trade.

The Government shops which have been located at Gorgona in the Canal Zone, will shortly be abandoned and the village in which they are situated will be submerged in flooding the Canal. The equipment will be moved to Balboa where new shops have been built. The brass and iron foundries have been moved to this location. The shops at Gorgona were originally started by the French when the canal was originally commenced by them and have been in more or less continuous operation ever since. At the new plant in Balboa, 42 acres of land have been obtained for the various departmental shops.

Adjoining property has been purchased by the Laconia Car Company of Laconia, N. H. and an additional factory building is to be built upon it.

Additions are to be made to the plant of Long & Koch of Newark, N. J., manufacturers of jewelry. The plant is located on South Ave.

The Chicago Hardware Foundry of North Chicago, Ill. have completed plans for a new foundry and which will be 80 x 127 feet. The cost will be about $15,000.

The Celluloid Zapon Company of Stamford, Conn., manufacturers of Zapon lacquers, are to erect a steel addition to the factory which will be 41 x 114 feet. Another building 55 x 110 feet is also to be erected. The cost is estimated at $20,000.

The Lionel Mfg. Co. of New Haven, Conn., manufacturers of electrical toys, and now located at 140 Winchester Ave. are to erect a new plant in Hamden, Conn. and which will be 69 x 129 feet in size and two stories high.

The Bridgeport Die & Machine Company of Bridgeport, Conn. have purchased the molding machine business formerly conducted by the Bridgeport Foundry & Machine Company of this city. This molding machine is operated by compressed air.

The West Bend Aluminum Company of West Bend, Wis., manufacturers of sheet aluminum goods, are to replace their present frame buildings by brick buildings. New presses will be installed when the buildings are completed which, it is expected, will be early in the coming year.

The property of the American Voltite Company of New York City, who formerly manufactured "Voltite" a self plating preparation, were sold at public auction on Sept. 26 on account of the trustee in bankruptcy. The property consisted of chemicals for making the preparation and a small amount of machinery.

The Quigley Furnace & Foundry Company of Springfield, Mass., manufacturers of foundry equipment, are sending out to the trade Bulletin No. 2 describing their Continuous Revolving Shelf or Reel Type Core-Oven. This oven is applied to the baking of small cores and the cores may be placed on half of the shelf while the remainder are being dried.

At the recent meeting of the National Association of Brass Manufacturers held on Sept. 16th. and 17th. in Niagara Falls, Canada, the Regar Brass Works and the Sterling Brass Company, both of Cleveland, Ohio, were elected to membership. The asociation adopted a uniform standard flange for bibbcocks of varying sizes. The association also voted to adhere to the terms of sale previously adopted or 2 per cent. 10 days from date of invoice or 60 days net. The next meeting will be held in New York City in December.

The Phillips Metallic Hose Company has been incorporated in Jackson, Mich. with a capital stock of $100,000 for the manufacture of metallic hose.

A new building for a galvanizing department and general manufacturing is to be built by the Hunt, Helm & Ferris Company of Harvard, Ill. The size is to be 60 x 100 feet

The manufacture of hardware specialties is to be commenced by the Chatam Mfg. Co. of Chatam, Ont., Canada and an addition will be built at a cost og $20,000. New machinery will be installed for this purpose.

The United States Manufacturing Company, recently organized in Warren, Ohio, to manufacture vacuum sweepers, has commenced manufacturing in the Winfield Building. The president of the company is B. D. Knapp.

The Standard Smelting & Refining Co. has been organized in Cleveland, Ohio and will manufacture white metals, such as babbitt, solder, etc. A. J. Miller is the general manager and the plant is located at 2365 Canal Road.

At a meeting of the creditors of the Harvey J. Flint Company of Providence, R. I., manufacturers of jewelry, it was voted that an investigation of the affairs of the company be made. The liabilities are stated to be approximately $52,000.

A site has been purchased by the Joseph N. Smith Company of Detroit, Mich. for a new factory. Plans have been prepared for the buildings to be erected upon the site at a cost of $75,000. Automobile hardware such as windshields, handles and brass trimmings are manufactured by the company.

The John A. Roeblings Sons Co. of Trenton, N. J. are making a flat wire for use in stamping small metal goods and which they state can be used for electroplating without previous buffing. Buckles made from it need to be buffed but once and that after drawing. The surface of the wire is sufficiently smooth and free from seams to allow this.

A circular has recently been issued by the Bureau of Standards, Washington, D. C. entitled "Metallographic Testing" and which contains considerable useful and interesting information. The object is to bring before those interested in the subject, the method and prices charged by the Bureau for carrying out such tests and the conditions under which they are made. The Bureau will make tests of this nature for any outside parties.

Sherard Cowper-Coles, 1 Old Pye St., Westminister, London, England, the well known discoverer of "sherardizing" has granted a license to the British Mannesmann Tube Company for ferro-zincing or ironizing steel boiler tubes to prevent pitting or corrosion. They are eercting a plant for this purpose at Landore. This process consists of coating the tubes with a thin layer of pure iron which may or may not be afterwards coated with zinc. The coating of pure iron is found to be very inert to chemical action.

The Keelyn Electric Company of Milwaukee, Wis., manufacturers of electric motors and other goods, have gone into bankruptcy.

An addition to the plant of the Harrisburg Brass & Bronze Company at Harisburg, Pa. is to be made. The manufacture of brass, bronze and aluminum castings is carried on.

The foundry of the Red Jacket Mfg. Co of Davenport, Iowa, manufacturers of pumps, was recently destroyed by fire. The contract for the rebuilding of the plant has been let.

The Mount Carmel Brass Foundry Works, Inc. has been started in Mount Carmel, Conn. for the manufacture of brass and bronze castins. The president is Raffaele Biondi and the secretary and treasurer is Albert Pfeiffer.

The name of the Wire Specialty Machine Works of South Bend, Ind. has been changed to the Campbell Wire Specialty Works. Automatic wire forming machinery is manufacttured.

The Standard Tin Plate Co. of Cannonsburg, Pa. are now supplying tin-plate sheets lacquered with colored lacquer as may be desired and which can be used for many purposes direct without further lacquering.

A new brass foundry has been started at Appleton; Wis. by August Arndt, manufacturer of screen plates and brewery appliances. Joseph Thomas will have charge of the foundry, and who has devised a new method of casting screen plates

The Perfection Stove Mfg. Co. will start a plant in Sarnia, Ont. Canada for the manufacture of oil stoves. This company is a branch of the Cleveland Foundry Company of Cleveland, Ohio and a new and extensive plant will be manufactured. The new company has been capitalized at $2,000,000.

The Pacific Galvanizing Company of Long Beach, Cal. are building the first unit of a plant of large dimensions. It is stated that this will contain 10,000 square feet of space. The company is a consolidation of the Pague Mfg. Co. of Kansas City, Mo. and the Electrical & Mechanical Mfg. Co. of Los Angeles, Cal.

The Delaware Brass & Aluminum Co. which was recently organized in Muncie, Ind. has started the erection of a plant in that city. John Beckett is the president of the company, and Charles Beckett the secretary and treasurer. The directors of the company are P. J. Casey, Charles Bowers and R. G. Simmonds together with the president and treasurer.

The Emerson Laboratory of Springfield, Mass. analytical and industrial chemists, have moved to their new laboratory in the Chapin Building, directly across the street from the Hotel Kimball. This laboratory occupies a large portion of the second floor and the various departments are equipped with the most modern instruments and appliances. It is believed that this laboratory is now one of the best equipped in the United States for general analytical work.

The Evans Stamping & Plating Company of Taunton, Mass are now manufacturing a line of light tapping machines that they are placing on the market. These machines are called the "Tuttle Tappers".

The Pope Mfg. Co. of Hartford, Conn., manufacturers of automobiles, motorcycles, and bicycles, have reorganized their company under the laws of Massachusetts. The Pope Mfg. Company of Connecticut is now out of existence.

The Baird Machine Company of Bridgeport, Conn. have issued a new booklet entitled "Baird's Sectional Diagram for Quick Reference Tool and Die Grinder". The die and tool grinder made by the company is described.

A new plant is being built in Newark, N. J. by the Aluminum Goods Mfg. Co. of Manitowoc, Wis. This will take the place of the smaller plant now in existence. The new plant will be located at 520 Belmont Ave. and the size is to be 60 x 200 feet, six stories high.

The Peckham Mfg. Co., 238 South St., Newark, N. J., manufacturers of leather polishing meal, have recently brought a new combination of emery and leather meal which is used for cutting down the surface of metal goods by tumbling. It is stated that this new composition can be used over and over.

The Brown Instrument Company of Philadelphia, Pa., manufacturers of pyrometers and recording instruments, are sending out to the trade a new Bulletin called "A Letter to Users of 4000 Brown Electric Pyrometers and 100 Replies". This Bulletin will be sent to those who are interested in he matter of pyrometry.

Owing to the steady growth of their business, Davenport & Keeler, Inc., of New Britain, Conn., the well known analytical and consulting chemists, have been obliged to seek larger quarters and are now located at 441 Arch St. where their increased equipment and technical force will enable them to give very prompt service without sacrificing accuracy.

The General Electric Company of Schenectady, N. Y. are manufacturing and placing on the market a cloth pinion to be used in place of iron, steel or bronze. It is stated that the pinion will outwear a metal pinion many times and will not crack or chip. They say that cloth pinions have lasted two years in their own shops and that a metal pinion wore out inside of two months.

The offer of the receiver of the Pratt & Cady Company of Hartford, Conn., manufacturers of valves and hydrants, to sell the plant and business, has been accepted by Bishop White of West Hartford, Conn., and the sale can be made at any time before March 1st, 1914. It is stated that Mr. White will continue the business in a vigorous manner. The company is one of the largest manufacturers of valves in the United States and have had a reputation for high grade work

Plans are being prepared for a new brass foundry to be built at Barberton, Ohio by the Diamond Match Company of that place.

A factory is to be started by Harrison & Pepin at Chehalis, Washington for the manufacture of automatic electrical devices.

Work has already been started on the new foundry plant of the Pyle Brass and Aluminum Company at Akron, Ohio. It is located on Glenwood Ave.

Additions are to be made to the plant of the Werra Aluminum Foundry Company of Waukesha, Wis. ,manufacturers of aluminum castings.

A new plant is to be built by the Imperial Wire & Cable Company of Montreal, Canada and which will cost $2,000,000. It is stated that the building will be eight stories high.

The manufacture of jewelry has been commenced by the Koonz Manufacturing Company of Greenfield, Mass. A new factory, 30 x 100 feet was reecntly completed by them for this purpose.

The Ideal Electric Mfg. Co. has been incorporated in London, Ont. Canada for the manufacture of electric heating and cooking apparatus. The capital stock of the company is $40,000.

The Kerk-Matlack Metals Company has been incorporated in Philadelphia, Pa. with a capital stock of $6,000 and it is stated that an office wil be opened in the Real Estate Trust Building.

The Heon Electric Reminder Company has been organized by Charles Heon with a capital stock of $15,000. A plant is to be established at Janesville, Wis. for the manufacture of electric time recording and alarm devices.

## Personal.

T. B. Haddow, formerly in charge of the plating department of August Goerz & Co. of Newark, N. J., is now associated with Adolf Neubeck of Buffalo, N. Y. and has charge of the Neubeck Electroplating Company.

## Obituary.

Herman Hegeler of the firm of Hegeler Bros. of Danville, Ill. zinc smelters, died in Chicago, Ill. on August 30th. He was returning home from the Yellowstone Park where he had gone in search of health. He was born in La Salle, Ill. in 1872 and was the son of Edward C. Hegeler who came from Germany fifty years ago and established the Matthiesen & Hegeler Zinc Works in La Salle. Mr Hegeler was a graduate of Ann Arbor University and later studied at Cornell. He was associated until 1905 with Matthiesen & Hegeler when, with his brother, he established the firm of Hegeler Bros. in Danville.

# Current Metal and Supply Prices.

**These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.**

| | | |
|---|---|---|
| Acetone, [illegible] 99%, | lb. | [illegible] |
| Acid, Acetic, pure 30%, | lb. | [illegible] |
| Acid, Acetic [illegible] (White Vinegar) | lb. | 10 |
| Acid, Benzoic | lb. | [illegible] |
| Acid, Boracic (Boric), pure | lb. | [illegible] |
| Acid, Hydrochloric, see Acid, Muriatic | | |
| Acid, Hydrofluoric, 30%, | lb. | 04 |
| Acid, Hydrofluoric, 60%, | lb. | 10 |
| Acid, Muriatic, 20° | lb. | 02 |
| Acid, Muriatic, c. p., 20° | lb. | 07 |
| Acid, Nitric, 38° | lb. | [illegible] |
| Acid, Nitric, 40° | lb. | 05⅞ |
| Acid, Nitric, 42° | lb. | 06¼ |
| Acid, Nitric, c. p. | lb. | 08 |
| Acid, Sulphuric, 66° | lb. | 01¾ |
| Acid, Sulphuric, c. p. | lb. | 06 |
| Alcohol, Wood | gal | 55 |
| Alcohol, Denatured | gal | [illegible] |
| Alum | lb. | 04 |
| Aluminum, Metallic in Ingot | lb. | 21 |
| Ammonium Sulphate | lb. | [illegible] |
| Aqua Fortis, see Acid, Nitric | | |
| Ammonia Water (Aqua Ammonia), 20° | lb. | 04¾ |
| Ammonia Water (Aqua Ammonia), 26° | lb. | 06¼ |
| Ammonia Water, c. p. | lb. | 08 |
| Ammonium Carbonate, lump | lb. | [illegible] |
| Ammonium Chloride (Sal Ammoniac) | lb. | 12 |
| Ammonium Hydrosulphuret | lb. | [illegible] |
| Ammonium Sulphate | lb. | 06 |
| Ammonium Sulphocyanate | lb. | 50 |
| Amyl Acetate | gal | [illegible] |
| Antimony | lb. | [illegible] |
| Arsenic, Metallic | lb. | 10 |
| Arsenic, White (Acid Arsenious) | lb. | 10 |
| Argols, White (Cream of Tartar) | lb. | [illegible] |
| Asphaltum, Commercial | lb. | 05 |
| Asphaltum, Egyptian (Bitumen) | lb. | [illegible] |
| Benzine | gal | [illegible] |
| Benzol, Pure | gal | 60 |
| Bismuth, Metallic | lb. | [illegible] |
| **Bitumen, see Asphaltum.** | | |
| Blue Vitriol, see Copper Sulphate | | |
| Borax, Crystals or Powdered | lb. | 10 |
| Borax Glass | lb. | [illegible] |
| Cadmium, Metallic | lb. | [illegible] |
| Carbon, Bisulphide | lb. | 10 |
| Calcium Carbonate (Precipitated Chalk) | lb. | 10 |
| Chrome Green | lb. | 30 |
| Copper, Lake (Carload) | lb. | 16¾ |
| Copper, Lake (case) | lb. | 17 |
| Copper, Electrolytic (case) | lb. | 16¾ |
| Copper, Electrolytic (carload) | lb. | 16½ |
| Copper, Casting (carload) | lb. | 16¼ |
| Copper, Casting (case) | lb. | 16½ |
| Copper Acetate (Verdigris) | lb. | [illegible] |
| Copper Carbonate, dry | lb. | 16 |
| Copper Sulphate (Blue Stone) | lb. | 06 |
| Corrosive Sublimate, see Mercury Bichloride | | |
| Cream Tartar, see Potassium Bitartrate | | |
| Cryolite | lb. | [illegible] |
| Cyanide, see Potassium Cyanide | | |
| Dextrin | lb. | 10 |
| Emery Flour | lb. | 04 |
| Emery, F. F. & F. F. F. | lb. | 03 |
| Flint, powdered | lb. | 01 |
| Fluor Spar | lb. | 01¼ |
| Fusel Oil | gal | [illegible] |
| Gold Chloride | oz | 11 75 |
| Gold, Pure | oz | [illegible] |
| Gum Copal | lb. | 30 |
| Gum Guaiacum | lb. | 26 |
| Gum Mastic | lb. | [illegible] |
| Gum Sandarac | lb. | [illegible] |
| Gum Shellac, brown | lb. | 50 |
| Gum Shellac, white | lb. | 60 |
| Iridium | oz | [illegible] |
| Iron Perchloride | lb. | 25 |
| Iron Sulphate (Copperas) | lb. | 05 |
| Lead Acetate (Sugar of Lead) | lb. | 15 |
| Lead, Pig | lb. | 04¾ |
| Lead, Red | lb. | [illegible] |
| Lead, Yellow Oxide (Litharge) | lb. | [illegible] |
| **Liver of Sulphur, see Potassium Sulphide** | | |
| Manganese, Ferro, 80% | lb. | [illegible] |
| Manganese, Metallic, pure | lb. | [illegible] |
| Magnesium, Metallic | lb. | [illegible] |
| Mercury Bichloride (Corrosive Sublimate) | lb. | 1 12 |
| Mercury, Metallic (Quicksilver) | lb. | [illegible] |
| Mercury Nitrate | lb. | 1 50 |
| Mercury Oxide, yellow | lb. | 1 80 |
| Nickel and Ammonium Sulphate (Double Salts) | lb. | 08½ |
| Nickel Carbonate, dry | lb. | 60 |
| Nickel Chloride | lb. | 50 |
| Nickel, Metallic | lb. | 45 |
| Nickel Sulphate (Single Salts) | lb. | [illegible] |
| Nitre (Saltpetre), see Potassium Nitrate | | |
| Oil of Vitriol, see Acid, Sulphuric | | |
| Paraffine | lb. | [illegible] |
| Phosphorus, yellow | lb. | 40 |
| Phosphorus, red | lb. | 1 10 |
| Pitch | lb. | 05 |
| Plaster of Paris, Dental | bbl. | 4 00 |
| Platinum Chloride | oz | [illegible] |
| Platinum, Metallic | oz | 45 00 |
| Potash by Alcohol (in sticks) | lb. | 45 |
| Potash, Caustic | lb. | 06 |
| Potassium Bichromate | lb. | 14 |
| Potassium Bitartrate (Cream of Tartar) | lb. | .31 |
| Potassium Carbonate (Pearlash) | lb. | 10 |
| Potassium Chlorate | lb. | .15 |
| Potassium Cyanide | lb. | 25 |
| Potassium Iodide | lb. | [illegible] |
| Potassium Nitrate (Nitre or Saltpetre) | lb. | 10 |
| Potassium Permanganate | lb. | 17 |
| Potassium, Red Prussiate | lb. | [illegible] |
| Potassium Yellow Prussiate | lb. | [illegible] |
| Potassium Sulphide (Liver of Sulphur) | lb. | 15 |
| Potassium Sulphuret, see Potassium Sulphide | | |
| Potassium Sulphocyanate | lb. | 70 |
| Pumice, Ground | lb. | 05 |
| Quartz, Powdered | lb. | 01 |
| Rosin, Yellow | lb. | 08 |
| Sal Ammoniac, see Ammonium Chloride | | |
| **Sal-Soda, see Sodium Carbonate.** | | |
| Silver Chloride, dry | oz | 75 |
| Silver Cyanide | oz | 1 00 |
| Silver, Fine | oz | 61 |
| Silver Nitrate, crystals | oz | .50 |
| Soda Ash | lb. | 05 |
| Sodium Biborate, see Borax | | |
| Sodium Bisulphate | lb. | .15 |
| Sodium Carbonate (Sal Soda), crystals | lb. | 02 |
| Sodium Hydrate (Caustic Soda) | lb. | 05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | lb. | 45 |
| Sodium Hyposulphite ("Hypo") | lb. | 04 |
| Sodium, Metallic | lb. | .90 |
| Sodium Nitrate | lb. | 05 |
| Sodium Phosphate | lb. | 09 |
| Sodium Silicate (Water Glass) | lb. | 04 |
| Soot, Calcined | lb. | 15 |
| Spelter, see Zinc. | | |
| Sugar of Lead, see Lead Acetate | | |
| Sulphur (Brimstone), in Lump | lb. | .05 |
| Tin Chloride | lb. | [illegible] |
| Tin, Metallic | lb. | [illegible] |
| Turpentine, Venice | lb. | [illegible] |
| Verdigris, see Copper Acetate | | |
| Water, Distilled | gal | .15 |
| Water Glass, see Sodium Silicate | | |
| Wax, Beeswax, yellow | lb. | 45 |
| Wax, Carnauba | lb. | 70 |
| Whiting (Ground Chalk) | lb. | 02 |
| Zinc, Carbonate, dry | lb. | 12 |
| Zinc, Chloride | lb. | [illegible] |
| Zinc Sulphate | lb. | 06 |
| Zinc (Spelter) | lb. | 05½ |

# THE BRASS WORLD AND PLATERS' GUIDE

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## The Extrusion Process.

The extrusion process as carried on to-day in brass rolling mills is the application of an old method to the brass industry. It is a modification of the old process of making lead pipe which has been in use for many years and is an extrusion process pure and simple. In the manufacture of lead pipe, the lead, either cold or slightly warm, is forced out of an orifice by means of a powerful hydraulic press and a core inserted in this orifice, produces the hole in the pipe. In the extrusion process, as practiced in the brass industry, a brass mixture, which is soft while hot, is forced out of an orifice while in the heated condition and the shape of the die, through which the brass is forced determines the cross-section of the rod.

The only difference, therefore, between the lead pipe machine and the extrusion machine is that the lead pipe is forced out cold and the brass is used red-hot. It will be seen, therefore, that there is no difference and this is why there were no basic patents on the machine and why the only patents that have been granted have been upon minor parts of it, principally the "container" which is the head holding the die through which the metal passes. This container is really the essential portion of the machine and is one upon which nearly every company which carries on the process has patents. The hot billet that is extruded must necessarily be protected from rapid cooling while the ram of the hydraulic press is brought to bear upon it and forces the metal from the die. The use of non-conducting material and a special construction of the container are necessary to bring this about.

At the present time the extrusion process seems to be limited to the very high brass alloys that are quite soft while hot. Ordinary brass is not malleable while hot, and the low brasses and bronzes are quite hard while red-hot; but, strange to say, the brasses which are the hardest while cold are the softest while red-hot and such brasses lie between 50 and 60 per cent. copper, and it is these brasses which are used for making extruded brass rods. A favorite mixture for this purpose and one almost exclusively employed is:

| | |
|---|---|
| Copper | 55% |
| Zinc | 45% |

This mixture, although hard and stiff while cold, is as soft as lead or even softer while hot and extrudes readily in the extrusion machine. By the use of this mixture, therefore, not only is a soft alloy obtained while hot, but one that is cheap, and in addition a very strong and stiff rod is produced. Small amounts of foreign metals such as lead, iron, tin or nickel do not appreciably affect the hot working properties of this mixture so that scrap can be employed without danger. In fact, some brass rolling mills utilize their washings in this manner.

Concerning the low brasses (which are malleable while hot) and the bronzes, little progress has been made with them. Although rods and even tubes have been made from them, they have been found too hard while hot to work satisfactorily in the extrusion machine, and the 55 and 45 mixture is used.

There are now about a half dozen concerns operating extrusion machines in the brass business and there seems to be room for all as the demand for special shapes is increasing.

## Is Nickel Plated Steel Rust Proof?

The extensive use, at the present time, of sheet steel goods and the fact that a large proportion of them are nickel plated, frequently is responsible for the question, is nickel plated steel rust proof? We think that it is not, nor do we believe that as a commercial proposition, taking into consideration the method employed for doing it, it is possible.

One must not infer that it is impossible to make nickel plated steel goods which are rust proof. On the contrary it is, but it will be found too costly to carry out and the price obtained for the goods would not admit it so that, in fact, it would possibly be cheaper to employ sheet brass as a base.

Sheet steel is used for making a large variety of small metal goods such as buckles, fasteners, hooks, clasps, and thousands of similar articles and which are nickel plated. Steel is used because it is cheap and there are few instances in which as great rust-proof quality as possible is not desired. The buckle business is one that causes considerable trouble and millions of nickel plated steel buckles are made for suspenders and other articles of wearing apparel. A rust-proof quality is quite desirable, but those who make them are continually having trouble on account of rusting. Storage in a damp place before shipment will frequently cause rusting to appear. Again, they will rust while on the goods, if they become damp. These difficulties have often resulted in many thousands of dollars being lost and the remedy appears to be a problem.

The nickel plating of such steel goods must be comparatively cheap, otherwise it would be less expensive to use sheet brass, but with the modern plating barrel, in which most small goods are now plated, it is possible to put on a good coat of nickel at a low cost. Platers have tried a nickel deposit of several hours duration, which is as much as it would be possible to give the goods, and still the articles would rust under the right conditions.

To be sure, by giving the steel a heavy acid copper deposit and then nickel plating them, a rust proof article could be produced, but this is too expensive. The nickel plating, however, as ordinarily put on commercial steel goods does not render them rust-proof, nor does it appear possible unless some preliminary deposit is put on underneath. Steel which has been nickel plated may not rust under ordinary conditions, but warm damp air or contact with moist fabric will usually bring it about.

In England, art metal goods which are known in this country as "soft-metal" or "antimonial-lead" are sold under the name of antimony wares.

# Copper Trolley Wire and its Value in the Brass Foundry, Methods and Errors in Using It.

Electric railway systems are now used all over the world and nearly all of them use the overhead trolley system. This fact means that there is now and will continue to be a constant output of scrap trolley wire from such railroads. The trolley wire gradually wears out and then, when it does, it finds its way into the hands of the scrap metal dealer from whom brass founders usually obtain it. Ordinary copper trolley wire is composed of the purest copper made, is hard drawn, so as to be as strong as possible, and is about ⅜in. in diameter. It is round, of course, but after it has worn out, the wire will frequently become quite elliptical for the reason that one side of it has worn to such an extent that the elliptical cross section is reached. Not all the trolley wire reaches this condition before it is removed from the line, but much of it does. It makes no difference, of course, whether it is round or elliptical, as far as the brass founder is concerned as both are equally as serviceable. Larger size trolley wire is often used, so that often several sizes may be encountered.

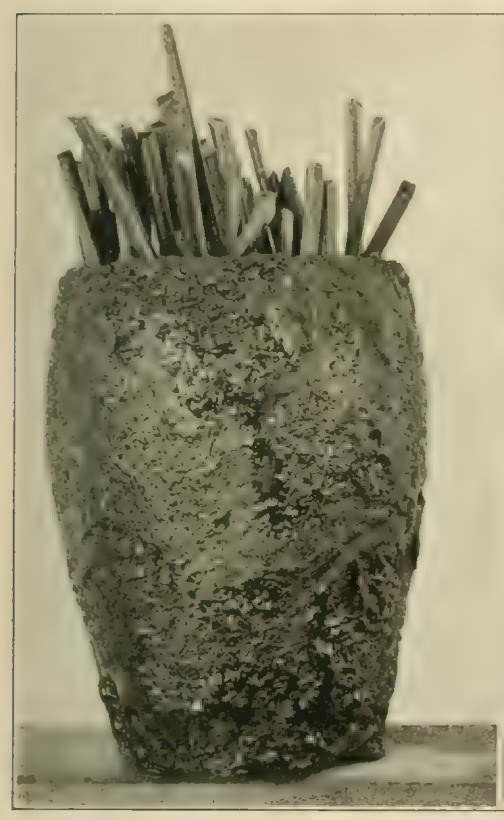


**Fig. 1. Wrong Method of Melting the Trolley Wire in Crucibles.**

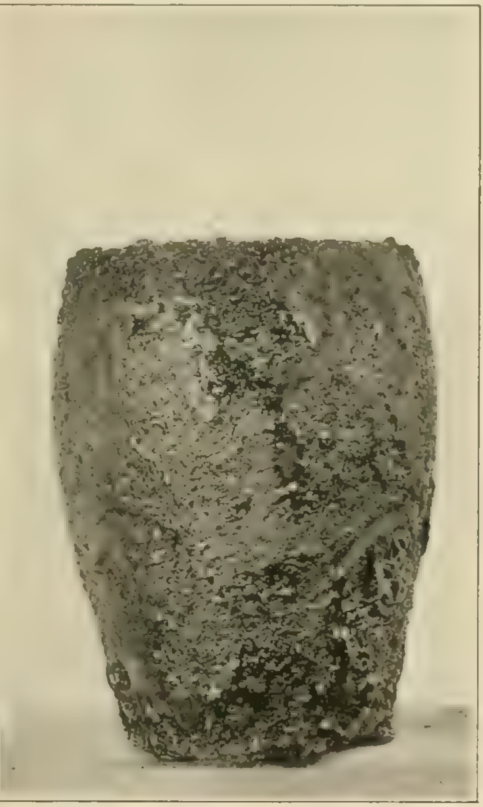


**Fig. 2. The Way the Crucible Should Appear if the Wire is Cut to the Right Length.**

### *Purity of Trolley Wire*

Copper wire, as now produced is the purest form of copper produced commercially. The requirement of such copper is that it shall have a high electrical conductivity and this means that it is of high purity for the reason that there is no better indication of purity than this test. The combined impurities are indicated and if the electrical conductivity is high, it shows that the total amount of impurities is small, and that the chemical purity is likewise high. Chemical analysis would not give any such accuracy and the electrical conductivity test is the one which never fails.

The consumer of copper wire requires it to be of high electrical conductivity and the copper producer, therefore, is obliged to test his copper in order that it may come up to specifications. The fact that copper for copper wire is rigidly tested when made and also the fact that copper must be pretty pure in order to roll and draw well, means that consumers of scrap trolley wire can feel safe that the copper is the purest commercial material.

### *Advantage of Trolley Wire*

In melting metals, the larger the mass, the better the product. Finely divided metal, such as chips, exposes so much surface when melted that there is an excessive oxidation and gas absorption. This fact means that the metal resulting from the chips is not as good as that obtained from melting a larger mass, such as ingots. For this very reason, trolley wire, on account of its large size, is much superior to finer copper wire. Many brass founders have discovered this fact when fine copper wire is melted. The resulting metal is not as good on account of the large surface exposed to the air and products of combustion during the melting operation. Trolley wire is of good size and packs well in the crucible so that there is very little surface exposed during the melting.

Copper trolley wire, when well packed in the crucible, is superior to many brands of ingot copper, especially some grades known as "casting copper" for the reason that these grades are more or less impure and no attempt is made to bring the copper to a high degree of purity. The scrap trolley wire, therefore, is quite pure and far superior to some casting brands. It is not infrequent to find some of these brands of casting copper to contain considerable antimony, arsenic, iron or sulphur which injure it for making castings. As copper trolley wire may be purchased equally as low and frequently lower than casting copper it is usually to the advantage of a brass founder to use it. To be sure, good grades of ingot copper are preferable to trolley wire, but such copper usually costs more.

### *Silicon Bronze Wire*

The only other kind of wire ever used for trolley wire except copper is known as "silicon bronze wire" and it is employed on account of its greater strength and resistance to wear. At the present time very little is used on account of its extra cost and higher resistance than copper to the passage of the electric current. At one time it was employed for a continuous line, but now it is only used for curves or long spans. One might use trolley wire a whole year and never find a piece of silicon-bronze it it, the quantity used is so small in proportion to that of copper.

In addition, should a little silicon copper wire become mixed with the copper wire it would do no harm. It is practically pure copper with a little tin and a trace of silicon so that it will readily be appreciated that no harm can be done, inasmuch as a brass founder uses tin in nearly all his mixtures. The silicon is so small, if any is actually present in the finished wire, that it can have no effect on the metal. In making the silicon-bronze wire, but 0.05% of silicon is ever added and this is nearly all oxidized out in melting, by the reaction with the oxide of copper so that it is not a rare thing to find no silicon in the silicon bronze obtained as the finished product. Silicon-bronze wire, therefore, is really nothing but copper and tin. As made, the following mixture is used:

| | |
|---|---|
| Copper .................. | 98.55% |
| Tin ..................... | 1.40% |
| Silicon ................. | 0.05% |

Silicon bronze wire has practically the same color as copper and in the form of scrap it cannot be distinguished, but when clean it has a little lighter shade than pure copper although it is quite difficult to tell unless one is quite familiar with it. In the form of scrap, therefore, it will have the same appearance as copper. The only method by which it can really be distinguished is by chemical analysis and a test for tin will demonstrate whether it is pure copper or not.

As previously stated, however, the quantity of silicon-bronze wire used is so small that users of scrap trolley wire have nothing to fear. They may never come in contact with it. Should they encounter a piece, it will not injure the metal, but a little more tin will be introduced.

### *Using Scrap Trolley Wire.*

Electric railway companies sell their old trolley wire in coils and such coils are about 4 feet in diameter and difficult to handle on account of the stiff nature of the wire. The coil must be strongly tied or the wire will spring apart. Scrap metal dealers purchase such coils and cut them into small pieces on power shears. If a brass founder is fortunate enough to possess shears of this kind he can use the coils as they are obtained from the electric railways, but unless he has, he will find it laborious to attempt to cut the wire with a cold-chisel by hand. It is usually customary, therefore, to purchase the trolley wire from the scrap metal dealers cut up into short lengths so that they will go into a crucible. It is more economical to do this and all scrap metal dealers now carry trolley wire cut in this manner. It is one of the standard scrap metal products.

### *Short Lengths Necessary*

In the use of trolley wire, cut into lengths, there is one feature that is very objectionable, and one which, if good results are desired, should be guarded against, and that is the use of too long lengths. Naturally, in cutting the wire, it is cut into as long lengths as possible as the labor is then less, but this is very objectionable, and those who purchase the wire should specify the lengths desired.

The objection to long lengths of wire is that they protrude above the top of the crucible and come in contact with the products of combustion while melting. In the photograph herewith shown in Fig. 1 this fact is illustrated. The wire, as ordinarily used, projects quite an extent above the top of the crucible. The portion which projects above the crucible is that which is injured in melting as it cannot be covered with charcoal and comes into direct contact with the flame and products of combustion. The result is that the copper is oxidized and it absorbs gases both of which greatly injure the metal. It is easy to cut the wire into pieces that will enter the crucible so that the ends will not protrude above the top of the crucible and it will have the appearance shown in Fig. 2. When this is the case, charcoal can be placed on the crucible so that the wire will be covered and there will be no danger from oxidation and gas absorption.

The melting of the trolley wire, therefore, requires the following:

1. The wire shall be cut into pieces sufficiently short so that they will pack in the crucible an inch or so below the top and give plenty of opportunity for the charcoal to be placed on it.
2. Charcoal shall be used on top of the wire in the crucible so that it will be protected from the products of combustion and the air.

When these suggestions are carried out, equally as good results will be obtained from trolley wire as from the best ingot copper and brass founders need have no hesitancy in using it. If, however, the copper is used in such long lengths that the ends project above the top of the crucible, good results cannot be expected, and this is the reason why many brass founders have not been able to obtain good results in the use of this scrap material.

## The Use of Soap-Bark for Tumbling Small Metal Goods.

**By W. G. Stratton.**

Soap-bark is used as a lubricant in tumbling small metal goods, both before and after plating, to produce a high lustre. The bark can be purchased in three different grades, viz. Crushed, cut and powdered and the different sizes are suitable for various kinds of work.

The coarse soap bark can be used for the larger work and retains its soap giving qualities longer than the powdered material which must be used on very small, light work. The coarser grades, if used on this small work, would remain with it when washed, and be difficult to remove.

Soap-bark is usually used in connection with cream of tartar in the proportion of 2 parts of cream of tartar to 1 part of soap-bark. The cream of tartar acts like a mild acid dip, removing the oxides and brightening the work, while the soap-bark causes it to become burnished to a high color.

A small amount of this mixture of cream of tartar and soap-bark, about a teaspoonful to each rolling barrel, is usually enough, but in some instances more is necessary.

The work must be perfectly clean and free from oil in order to produce good results. This is usually accomplished by first grinding the work with pumice, silica or sand in a potash or soap solution. Then, after a thorough washing, the soap-bark and cream of tartar solution is used.

If the work is properly done, it will be in a perfect condition, chemically clean, so that it may be plated directly after rinsing without the customary potash or cyanide dips and will never fail, even if subjected to the severest tests.

## Various New Alloys.

Various new non-ferrous alloys have recently been patented and which are of more or less interest.

### *Aluminum Alloy*

An aluminum alloy has been patented by William A. McAdams of Bay Shore, N. Y. It consists of the following:

| | |
|---|---|
| Aluminum | 60 parts |
| Zinc | 20 parts |
| Silver | 16½ parts |
| Copper | 5 parts |

It is stated that this alloy is "well adapted for casting and is very strong, resonant and has a permanent superior lustre." No other information is given about its properties.

### *Copper Alloy*

The copper alloy is patented by William F. Nolan of St. Paul, Minn. The invention relates to a method of hardening copper or brass and this is accomplished by means of manganese, vanadium and aluminum. The alloy claimed is as follows

| | |
|---|---|
| Copper | 98.15% |
| Manganese | 1.48% |
| Vanadium | 0.25% |
| Aluminum | 0.12% |

It is claimed that the alloy is very hard and strong and may be used for cuttting tools. It is also claimed that it may be hardened by heating it and immersing in oil. Copper, it is said, may, in this way be made about as hard as tool steel. Among the uses for the alloy are mentioned journal bearings and cutting tools for wood.

### *Lead Alloy*

Charles P. McConnell of the Western Electric Co. of New York City has patented a lead alloy of the following proportions:

| | |
|---|---|
| Lead | 95.00% |
| Antimony | 4.50% |
| Tin | 0.50% |

The alloy is used for rolling into tape to be used for winding electrical conductors, such as telephone switchboard cables. It is stated the tape is to replace lead tape usually employed for this purpose and for which, on account of its increased strength only about half the thickness may be employed. Although the cost is slightly increased it is more economical on account of a less quantity being required.

### *Nickel-Iron-Aluminum-Manganese Alloy*

An alloy of nickel, iron, aluminum and manganese has been patented by Walter Rübel of the Rübel Bronze Co. of London, England. It consists of the following:

| | |
|---|---|
| Nickel | 32 parts |
| Iron | 31 parts |
| Aluminum | 30 parts |
| Manganese | 7½ parts |

The alloy is to be used with other metals to form other alloys and may be called a "rich alloy" or "temper." The inventor states that it may be used with copper and aluminum to form a bronze. The proportions are multiples of the atomic weights of the various ingredients.

## Use of Magnesium in Refining Copper.

European engineers have recently made some experiments on the refining of copper by means of metallic magnesium and have found it an excellent material for the purpose. It is not useful, however, for removing the arsenic, antimony, iron or other foreign metals in the copper, but to reduce the oxygen in it. The powerful affinity of magnesium for oxygen has made this possible. The time required for the refining is quite short.

The amount of magnesium to be used is small and it is essential that no greater amount than the theoretical quantity shall be employed. It is advocated that the necessary amount of magnesium shall be calculated from the quantity of oxygen present in the copper and this is usually from 0.10% to 0.30%. If an excess of magnesium, over and above that required for reducing this quantity of oxygen present, is used, the excess remains in the copper and defeats the end.

The reaction between the oxide of copper and the magnesium forms oxide of magnesium which on account of its lightness rises to the top of the molten metal. The plan suggested to avoid this is to cover the copper with an acid slag containing silica, boric acid, etc., which will combine with the oxide of magnesium forming a fusible slag.

In refining the copper in this manner, it is recommended that the copper be nearly refined in the usual manner and finished by means of magnesium

# Some Notes on the Hot Tinning of Iron and Steel.

The hot tinning of iron or steel is an old process and one which has undergone little modification during late years. Before electroplating became so extensiely employed, it was customary to use tinned iron or steel for a great many purposes for which nickel plating is now used. Galvanized surfaces, particularly those which have been electrogalvanized, are likewise employed at the present time where tinned ones were formerly used. The cost of tin has always been an objection to its use, and at the present time it is more of an objection than ever before.

### *Attempts to Cheapen Tinning.*

Since tin has become so expensive, attempts have been made to cheapen the tinning process but with little success. The largest consumption of tin is in the manufacture of tin plate so extensively used for tin cans, and for this purpose nothing has been found that will take its place or cheapen the tin coating. Lead is the natural adulterant for tin and it is extensively used in the manufacture of tin roofing plates which, when considerable lead is used with the tin, are called "terne plates." It is possible to use lead with the tin for coating iron and steel and the mixture used for this purpose may contain only a few per cent. of tin and yet adhere to the iron or steel base. This, however, defeats the end for the majority of tinned goods used at the present time are tinned because they are used for containing foods, such as, for example, tin cans, or are used in connection with foods as in the case of food choppers, cooking utensils and milk cans. It is impossible, therefore, to use even a small percentage of lead with the tin. In other instances, where the tin is not to be used for holding foods or does not come in contact with them, lead may be used with the tin, if desired, but there are very few instances in which this can be done for the reason that such articles are usually galvanized or plated. The reason why tin is used is that it is not poisonous and is not appreciably acted upon by ordinary foods.

The use of lead with the tin is also open to the objection that the tinned surface is not bright and the presence of the lead is indicated. There are a few instances in which lead can be used and is used and one of such cases is in the so called tinned brass condenser tubes. Some manufacturers use nearly equal parts of tin and lead for this purpose, but this is an instance in which the appearance does not matter and the protection against corrosion is probably as good as though pure tin were used.

Regular Form of Pig Tin. Weight about 100 lbs.

The other metals which one might think could be used for cheapening the tin are, zinc, aluminum, antimony, or copper. Zinc alloys with tin readily, but renders it more or less thick so that it does not flow freely. The result is that the tinned surface is not smooth and if considerable zinc is used, the coating is rough and unsightly. Antimony may be used in a very small amount but in such small quantities that little is gained. If more is added, the tin is thickened so that it does not flow freely. Copper is even worse and even a few per cent. of copper will thicken the tin so that it is difficult to coat surfaces with it. As far as aluminum is concerned, this cannot be used at all. It prevents the tin from adhering to the iron or steel. The difficulty of soldering aluminum or its alloys is well known and it is natural, therefore, that aluminum should act in the same manner when used with tin.

It will readily be understood, therefore, that it is impossible to cheapen tinning and previous attempts have resulted in failure. The use of pure tin is necessary, accordingly, if both a bright coating is desired and one which will resist the attacks of foods.

*(To Be Continued)*

## The Properties of Boron.

Of the common elements, boron has been as little understood as any. Commercially, two of its compounds only have been in use. They are ordinary borax, which is a borate of sodium, and boracic or boric acid, which is an oxide of boron. Elementary boron has not been a commercial article, nor have but few persons ever seen it. Boron belongs to the class known as "metalloids" or the half-metals and to which silicon likewise belongs.

Dr. E. Weintraub of the General Electric Co. of Lynn, Mass., has made a special study of the reduction and properties of boron and has discovered some very interesting facts regarding it. Among the valuable properties of boron are its great changes in electrical conductivity for temperature, and its value in the purification of copper and its alloys. Dr. Weintraub recently discovered a process of reducing boron from boron chloride by means of hydrogen. In connection with this process, he gives some interesting and valuable data in regard to the properties of boron. This data is as follows:

"The boron produced is not the material commonly designed as boron, in the technical literature. Moissan made what he called "boron" by reduction of boric anhydrid with magnesium. He described the product as a brownish powder, practically non-conductive for electricity, and vaporizable without fusion. Prior to my own investigation of boron and its compounds, this was the material generally recognized among chemists as boron. I have, however, demonstrated that it is not pure boron at all. If the reaction is carried out as described by investigators preceding Moissan, the product is magnesium borid, containing more or less magnesium; if the reaction is carried out according to Moissan, using an excess of boric anhydrid, a boron suboxide is formed mixed with more or less magnesium boride.

I have found that pure boron is black, not brown, and that it can be fused into dense bodies having a conchoidal fracture, and a hardness considerably greater than sapphire. Its melting point is above 2000° C. Its vapor tension is high. While it has a high electrical resistance when cold, it possesses a negative temperature coefficient of resistance of unprecedented magnitude, so that it acts as a fair conductor of electricity by the natural rise in conductivity due to the heating action of the current. I have found that at ordinary room temperatures the conductivity of pure boron doubles approximately for every 17° of temperature. In changing from room temperature to 400° C., its conductivity increases enormously, changing according to the ratio of about one to two million. At high temperature boron combines with oxygen and is again converted into boric anhydrid."

## A Nickel and Silicon Alloy for Thermo-Couples.

The use of pure nickel in thermo-couples is attended with the objection that it frequetntly develops brittle spots so that it breaks in use. It is well known that nickel unites with carbon monoxide gas and this, it has been suggested, is the cause of its becoming brittle when used in furnace work.

A method of overcoming this brittleness has been patented by Albert L. Marsh of the Hoskins Mfg. Co. of Detroit, Mich. He has found that if the nickel be alloyed with from 3 to 5 per cent. of silicon, the brittleness does not take place. As this alloy is apt to be short in working, the addition of a small amount of some deoxidizing agent is introduced and for this purpose manganese or aluminum is used. The amount of these deoxidizing agents to be employed is not given, but probably in a quantity of a few hundredths of a per cent.

## Spotting-Out of Lacquered Sheet Brass Work.

As far as the effect is concerned, spotting-out, no matter what kind and how it is produced, gives the same results, *i. e.* the finish of the surface of the work is injured. In every instance the solution, which is retained either in cavities or by blisters, exudes and gradually spreads around the immediate vicinity of the place from which it makes its exit and corrodes the metal, producing the familiar spots.

In the case of castings, the cause of the spotting-out is the oozing out of the solution (usually plating solution) from the cavities and corroding the surface contiguous to the cavity itself. The remedy, of course, is to remove the solution from the cavity before finishing.

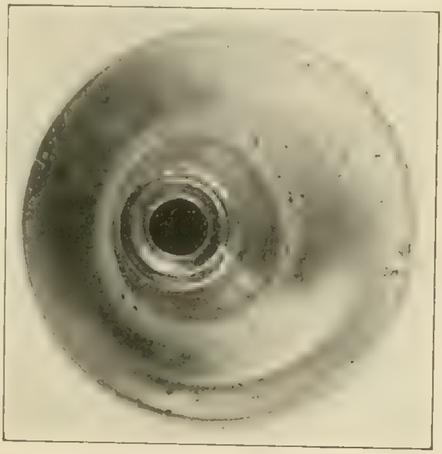
There is another kind of spotting-out that is now and then encountered and which is more preplexing than that which occurs in the case of castings. It is the spotting-out which occurs on lacquered sheet brass work and an illustration is shown in the photograph herewith reproduced. The spotting does not occur until a long time after the goods have been finished and to the average observer, it would at first appear that the spots were fly-specks, but a more careful inspection indicates that they are not, but actual corrosion.

On sheet brass work, one would naturally think that there could be no spotting-out for the reason that the surface has been rolled and is free from the cavities found in castings. This is true and sheet brass is practically free from any cavities, and gives the least trouble, as far as plating is concerned, of any metal. The spots will occur, however, and as all platers know that sheet brass is the easiest metal there is to plate, it is natural to lay it to the lacquer for the reason that it is believed that the brass is simply buffed and then lacquered. It is quite natural to lay it to the lacquer. This blame, however, is not rightly placed and the lacquer is not the cause.

### *The Reason*

The difficulty is usually found on chandeliers which are composed of both tubing and spun shells and each is made of yellow brass. The shell shown in the illustration was a portion of a chandelier of this type and the spotting took place long after the lacquering had occurred and the chandelier had been in use.

The tubing used for the manufacture of chandeliers is almost exclusively the kind known as "brazed brass tubing" and is made from sheet and the seam brazed. Ordinary brass cannot be used for this purpose for the reason that it cannot be brazed as the melting point is too close to that of the brazing solder (half copper and half zinc) so that what is known as low brass is used and it is composed of about 3 parts of copper and 1 part of zinc. This mixture brazes easily. While this tubing answers admirably for chandelier and gas fixture work it has a different color from that of the ordinary sheet brass used for the shells. The color is greenish-yellow and is more pleasing than the ordinary yellow of sheet brass, but the high brass used for spinning and drawing the shells is considerably cheaper than the low brass and, for this reason it is used.



Yellow Brass Shell, Showing Spots Occurring on the Lacquer After a Number of Years.

There exist, therefore, two kinds of brass on a chandelier: Low brass tubing and high brass shells. The low brass tubing is, as previously stated, composed of 3 parts of copper and 1 part of zinc, while the high brass consists of approximately 2 parts of copper and 1 part of zinc. The colors are also different.

It is this difference in color that is the reason for the difficulty. To leave these two shades of brass on the chandelier would be poor policy for it would be quite noticeable to the customer, so that resort is had to brass plating the shells that they will match the tubing. The color of the tubing, as previously mentioned, is the better of the two and the shells are, accordingly, brass plated to match the tubing.

It is the brass plating that is the cause of the spotting and blistering of the brass deposit is the reason for it. The fact that the blistering of plated work is frequently the cause of spotting-out was first mentioned in THE BRASS WORLD, January 1910, page 23. This is a very common occurrence in copper or brass plating and, while it is, in many instances immediate, in others it will occur after the plating has been finished. It is often the case that the blistering will be very pronounced, and in others only a few minute blisters will be formed.

These blisters hold solution which cannot be rinsed off and remains underneath. Gradually, it oozes out and corrodes the surface with the formation of the familiar spots. It is unquestionably this phenomenon that causes the spots on some lacquered sheet brass work like that shown in the illustration.

The remedy for this trouble would be to use low brass for making the shells instead of high brass and then plating them, but manufacturers do not like to do it for the reason that the cost is then increased and in addition, low brass is quite apt to fire crack in annealing after articles have been spun or drawn. It is preferred to use high brass for the shells and brass plate them to match the color of the tubing.

A reason has been advanced that the sulphuric acid used in pickling the brass is the cause of the spots and that this penetrates the pores and oozes out when finished. Inasmuch as all brass rolled into sheet is, at some stage, pickled in this manner renders this idea wrong, as all sheet would then spot. Sulphuric acid is easily rinsed off and the brass sheet is not porous. The acid, therefore, cannot be the cause.

The fact that blistering is the cause of the spotting, is indicated by the following remarks of a manufacturer:

"A great deal of trouble is experienced with iron filled brass tubing as the brass in this case is very thin. There is not much trouble with the brass tubing which is used for chandelier work, but quite a bit is had with the iron filled tubing."

This experience indicates that the iron filled tubing, which consists of a thin covering of sheet brass drawn over a steel tube, is subject to spotting-out. The sheet brass is not soldered to the steel and there is a seam. Solutions, therefore, enter the seam and cavity. The fact that there is little difficulty with the regular brazed tubing indicates that there must be a cause other than pickle.

The fact remains that blisters are frequently a cause of spotting and that the shells of chandeliers are brass plated so that the color will be the same as tubing. It is believed that blisters are the cause of such a spotting as indicated in the illustration.

Brass plating is not difficult to perform, but good brass plating is, and one of the common difficulties encountered is blisters. It is more common than ordinarily imagined.

## A New Sterling Silver Alloy.

A new sterling silver alloy containing boron has been patented by Edward D. Gleason of New York City (U. S. Patent, 1,075,642) and which consists of the following ingredients:

| | |
|---|---|
| Silver ................ | 925 parts |
| "Boronized" Copper .. | 75 parts |

The "boronized" copper is, the inventor states, made in the following manner: Copper is heated with boron fluoride while in the molten condition and the boron unites with the copper forming the "boronized product." It is stated that the boron exists in the copper in the graphitoidal condition. The copper and boron alloy thus obtained is used in making the sterling silver by melting it with fine silver to the necessary fineness.

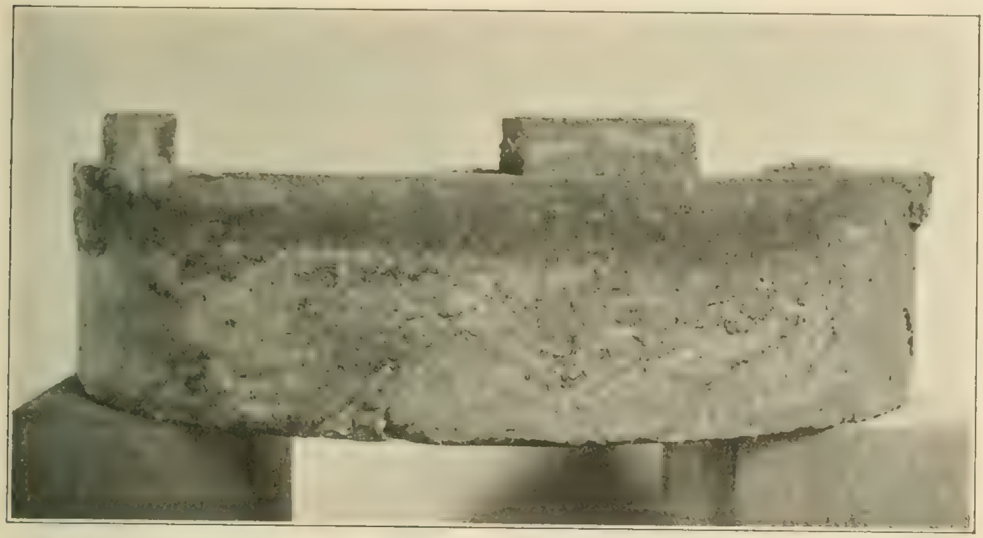
The advantage of the boron, it is stated, is that the sterling silver is much harder than ordinary sterling and under the right conditions (not stated) the metal may be made with a fracture like low carbon steel and cannot be rolled into sheet. It is also stated that the sterling silver thus made may be readily cast in sand and without the honeycomb defects usually found.

The inventor states that the sterling silver containing boron is particularly useful for "pierced" work as thinner sheet can be used and still have the same stiffness. The casting qualities of the sterling are likewise said to be excellent and free from the usual defects.

The inventor does not state the amount of boron that enters the copper by his method of treatment.

## "Wavy" Large Yellow Brass Castings.

Making large yellow brass castings is somewhat difficult and the one shown in the illustration is an example of this kind. One of the troubles is the formation of waves on the cast surface and this is the difficulty on the casting illustrated. These are frequently large and penetrate the metal to such an extent that finishing will not remove them.



Yellow Brass Casting Showing "Wavy" Marks.

Yellow brass is much more difficult to cast than the red metals for the reason that there is so much spelter present that a large amount of dross is formed. If the metal is poured cold the dross will enter with the metal and form the trouble shown in the casting reproduced. In casting brass for rolling, the best results are always obtained when the metal is poured "hot", and if poured "cold" a casting similar to that shown will be produced.

The casting shown is a portion of a valve and if a little aluminum is used say 0.14% or about 2 oz. to 100 lb. of brass, a good casting would be obtained and the metal would run at a low heat. While it is not advisable to use aluminum in the bodies or outside parts of a valve, it is admissable in portions that are inside and the one shown is of this nature. The use of aluminum would have avoided the trouble experienced.

If, however, aluminum cannot be used, then pour the yellow brass smoking hot and place a wood block on the metal in the pot while pouring takes place. Also place a wad of waste saturated with oil around the pouring hole in the sand and start it burning before the pouring takes place. The brass will then be poured through the flame and this, together with the wood block on the metal, will prevent to a large extent the formation of dross. This is the method frequently practiced in casting brass for rolling.

## A Method of Alloying Zinc and Lead.

If zinc and lead are melted together and allowed to cool, a separation takes place. Attempts have been made to coat iron or steel sheets with an alloy of this kind, but, owing to this separation it has not been attended with good results. H. J. Lohman of the Lohman Company of Jersey City, N. J. has patented a method of alloying zinc and lead which is quite simple. This is accomplished by the addition of a small amount of *mercury* to the melted zinc and lead.

It is stated that a very small amount of mercury only is required to bring about this union and as small a quantity as 0.10% will answer. It is introduced into the molten bath, and serves to prevent the separation of the zinc and lead. Steel or iron sheets, therefore, may be coated with the alloy of the two metals and this is the use suggested for the process.

## Chemicals Used in Electroplating.

### Carbonate of Soda.

Carbonate of soda is used quite extensively in electroplating and is known by a number of names. The correct chemical name is sodium carbonate, but the regular designation by which it is known commercially is carbonate of soda. Other common names are sal-soda, soda-ash, washing-soda and crystal soda.

Carbonate of soda is used in electroplating for a number of purposes. In copper and brass solutions it is used as a conducting salt and it is employed for the same purpose in gold plating baths. For making the carbonates of copper, zinc and nickel it is necessary and this is the largest use in the plating trades. Another use is in preserving steel from rusting after it has been cleaned and is ready for plating. Carbonate of soda is often used for cleaning grease from plated work, but less extensively than formerly for the reason this is too mild to work rapidly and efficaciously and other cleaning materials have almost supplanted it. In some classes of cleaning, too, it fails to remove the mineral grease or oil

Carbonate of soda is found in commerce in three varieties:

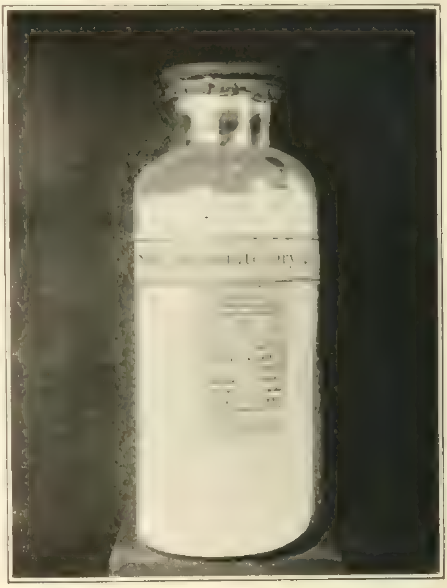
1. Ordinary crystal sal-soda.
2. Dry carbonate of soda or soda-ash.
3. Chemically pure carbonate of soda.

The ordinary crystal sal-soda found in commerce consists of transparent, white crystals that are very soluble in water. It contains 62 per-cent of water of crystallization. When, therefore, this water is driven off by heating the crystals, dry carbonate of soda is obtained. This is known as "soda-ash." In other words, soda-ash is dry carbonate of soda.

Soda-ash occurs in commerce as a dry, white granular material resembling coarse, white sand. It is the first product in the manufacture of carbonate of soda and ordinary crystal or sal-soda is made by dissolving the soda-ash in water and then crystallizing. Soda-ash, although it is more costly than ordinary crystal sal-soda, is more economical for the reason that it contains no water and the cost of transportation is much less. Nearly all large consumers of carbonate of soda, prefer to purchase this grade.

The chemically pure carbonate of soda is used in chemical work and pharmacy, and is usually sold in the dry form and in the manner shown in the illustration.

Let it be understood that ordinary sal-soda of commerce is quite pure and perfectly suitable for all plating solutions. The amount of impurities contained in it is so small that they have no influence at all upon the electroplating operation. It is useless, therefore, to purchase chemically pure carbonate of soda, as some platers frequently do, for this purpose. Traces of common salt and sulphate of soda are all that are usually present except, perhaps some dirt and sand which, of course, may be present in any commercial chemical and which do no harm.



**Chemically Pure Sodium Carbonate and Manner in Which it Occurs in Commerce.**

Practically all carbonate of soda is now made from common salt and has been made in this manner for many years. The Le Blanc process was first used in France in 1791 and a patent was granted by France to Nicolas Le Blanc for the invention. With very slight changes it is still employed.

The Le Blanc process of making carbonate of soda also produces muriatic acid as a by-product so that it is economical. The first step consists in heating the salt with sulphuric acid so that the muriatic acid is driven off and sulphate of soda remains. This sulphate of soda is then heated with coal so that sodium sulphide is produced. The sodium sulphide is next heated with limestone or other form of calcium carbonate and carbonate of soda and calcium sulphide are formed. Leaching with water is next used to remove the soluble carbonate of soda from the insoluble calcium sulphide. The clear liquor is then evaporated and dried to form ordinary soda-ash.

The rival of the Le Blanc process is the Solvay method and this also uses common salt for its raw material. Nearly half of the worlds supply of carbonate of soda is made by this process. It owes its value to the fact that there are no troublesome by-products and that a pure product is obtained.

The principle of the Solvay process lies in the fact that bi-carbonate of soda is but slightly soluble in a cold, ammoniacal solution of common salt. Roughly speaking, the operation consists in saturating a solution of brine (common salt) with ammonia gas and then passing carbon dioxide gas into it. Bi-carbonate of soda separates and is recovered. Ammonium chloride is obtained as a by-product, but is treated with lime to obtain ammonia gas again. Calcium chloride is obtained as a by-product.

The bi-carbonate of soda obtained in the Solvay process is heated to convert it into soda ash and drive off any ammonia which may remain in it.

It may be of interest to know that bi-carbonate of soda is carbonate of soda containing a greater amount of carbon dioxide (carbonic acid gas). When heated, the excess of carbon dioxide is driven off and soda ash or dry carbonate of soda remains. Ordinary commercial bi-carbonate of soda is quite pure and frequently rivals the c. p. carbonate of soda.

The use of copper for protecting the surface of a steel article which is to be case-hardened, but which cannot be hardened all over is now practiced. The portion of the surface of the steel which it is not desired to case-harden is copper plated and the hardening takes place in the usual manner. Even as thin a coating as 0.001 of an inch will, it is stated, serve the purpose.

## Soldering Fluxes for Soft Solder.*

There has always been more or less darkness in the soldering flux field and any light that can be shed upon the subject is always appreciated. W. Arthur has given us some data which is interesting. In regard to fluxes for soft solder, he gives the following information:

"The rapidity with which a flux acts is an important factor in its usefulness. If the flux be in the form of a dry salt, a comparatively large amount of heat may be necessary to melt it. If an aqueous solution be used, an additional large amount of heat must be used to evaporate the water, thus slowing the rate of action by cooling the parts to be soldered. This effect is negligible in most instances, but where it is necessary that the solder attach itself within a fraction of a second it becomes quite important.

If the flux does not require melting, but is a liquid, the action is much more rapid, as no time is required for the surface to be covered, and, no heat is used in fusing the salt. Further, the excess flux, which should always be present, readily flows out of the way.

Zinc chloride has several properties which make it a valuable soldering flux for most work. It is only with the greatest difficulty that it can be obtained as a dry salt, and when exposed to the air becomes liquid in a few minutes. When used as a flux it remains a liquid even at the temperature of molten solder; thus being in a condition to act upon the oxides very rapidly. It possesses other properties which make it undesirable for such work. Zinc chloride is poisonous, and should not be used in soldering fruit or meat tins. It is exceedingly corrosive to the skin, and when left upon it for a few minutes produces severe burns. It also has an action on zinc which makes it useless for soldering small zinc wires in fuse plugs. If low capacity fuse plugs be made, using zinc chloride as a flux, the small zinc wires such as shown will be found to be completely eaten through within a few weeks. Sometimes in a few days.

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*Abstract of a paper presented by W. Arthur of the General Electric Company, at Chicago Meeting of the American Institute of Metals.

An aqueous solution of ammonium phosphate was tried as a flux and worked quite well on tin, copper, brass or zinc, (but not well on iron), where delicacy of operation and speed are not to be considered. But where a quick fluxing is necessary, it is not successful, as too much heat is necessary to evaporate the water and melt the salt. It has the advantage, however, of being non-poisonous and non-corrosive, and does not tarnish copper or brass.

Lactic acid and ammonium lactate were tested as to their fluxing qualities, and were found to be splendid fluxes. Equal in every particular to zinc chloride, but in a few hours showed a tarnish if used on brass or copper. The reason for the ready tarnishing is that lactic acid and ammonium lactate react with copper oxide in the cold. Neither of these fluxes is corrosive or poisonous in any way.

Resin, either as a powder or an alcoholic solution, is a splendid flux where speed is not required. But it has the undesirable property of leaving a sticky, gummy mass after the evaporation of the alcohol, which is quite a hindrance in some kinds of work. Quite often a quantity of carbon and half decomposed resin is left where the solder is to follow. For ordinary work, where a non-poisonous flux is desired, resin is perhaps the most desirable.

An aqueous solution of citric acid is a good flux, having properties very similar to ammonium phosphate.

Ammonium chloride (sal-ammoniac) is widely used as a flux and is non-poisonous, and does not tarnish copper or brass. But when used on zinc, it forms zinc ammonium chloride and gives more or less corrosion of the zinc.

The use of sodium cyanide in electroplating has extended over several years and so far it has been found satisfactory.

The use of zinc pipes for conveying water has been described by a German author. It is claimed that they are made from "hard" zinc and are easily produced. They can be lined with tin if necessary and are stated to be free from the objectionable features of contaminating the water as lead does. The small amount of zinc dissolved is not injurious to the water. The pipes will stand a greater pressure than the lead, but cannot be used for hot water on account of their expansion. The method of making the pipes is not given.

## Correspondence.

### Monel-Metal Sand Castings.

*Editor:*

We, as the only commercial foundry making Monel-metal castings for industrial purposes, believe that the answer made to this question as published in THE BRASS WORLD (Question No. 1371, October, 1913) "hits the nail on the head", as we do not think the ordinary brass founder will make a success in melting Monel-metal with the equipment which ordinary brass foundries have.

We shall be pleased to make Monel-metal castings from all patterns, unless special or extraordinary design, at the following rates:

Castings weighing from 1 to 10 ℔s... 43c ℔.
Castings weighing from 10 to 25 ℔s... 41c ℔.
Castings weighing over 25 ℔s ... ... 39c ℔

*BAYONNE CASTING COMPANY,*
*Bayonne, N. J.*
*Oct. 20th.* 1913.

## New Books.

HENDRICKS' COMMERCIAL REGISTER. The twenty-second annual Revised Edition of Hendricks' Commercial Register of the United States for Buyers and Sellers has just been issued. It has been published annually since 1891 and is the most complete work of its kind published. It completely covers the architectural, engineering, electrical, mechanical railway, mining and manufacturing trades and is a necessary adjunct to any office. The present edition is the most extensive yet published and the additional amount of matter incorporated in the work may be appreciated from the fact that, while in the twenty-first edition, it required 122 pages to index the contents, 138 pages are required for the twenty-second or present edition. This actually means the representation of over 6,000 additional manufacturers. Buyers, manufacturers and others almost daily are called upon to locate some new maker of an article, or to find a list of all the manufacturers of a particular line and this work will be found of the utmost value in this direction. It is a valuable work of reference. The book contains 1,635 pages and is published by S. E. Hendricks Co., 74 Lafayette St., New York City. The work sells for $10.00 delivered.

## Yellow Brass Screw Rod and its Connection with the Scrap Metal Trade.

Years ago, yellow brass screw rod was one of the specialties of the brass rolling mill industry, but at the present time it is one of the principal products. The extensive use of automatic machines for making screws, studs, knobs and many other small turned articles has brought this about.

Brass screw rod owes its name to the fact that it is used for making screws and drill rod is another name for it. It differs from ordinary brass in that it contains lead to render it free cutting. Brass without lead gives long chips under the cutting tool which clog it and causes it to cut with difficulty. For this reason, such brass is given the name of "hard" in the trade although it may have a softness equal to the leaded brass, as far as the results of a test on a hardness testing machine is concerned. The fact that the metal is tough causes the name of "hard" to be given it. The leaded rod, however, cuts freely as the chips are short and, accordingly the name of "soft" is given such brass. In Fig. 1 are shown some brass chips cut from screw rod and which, it will be noticed are "short." In Fig. 2 are shown chips cut from a rod that was not leaded and which are long, tough ones.

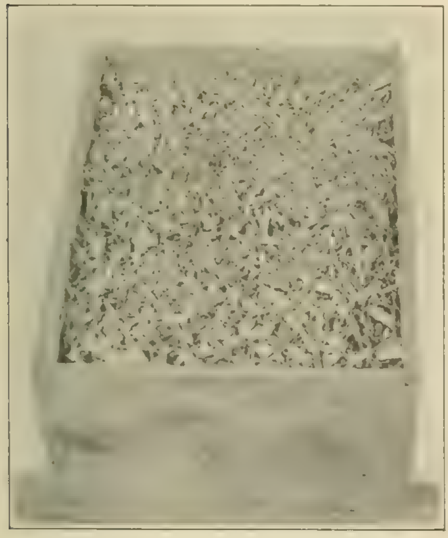


Fig. 1. Chips from Leaded Brass Screw Rod.

It is worthy of mention that, while leaded screw rod is used for making screws it is only machine screws. Brass wood screws are made from rod without lead for the reason that, although the thread is cut on them, the head is formed by "upsetting" and a leaded rod would not stand such treatment. Again, the rod would not be strong enough for a wood screw as there is a great deal of torsional strain put upon it when used and it would be apt to twist off. Chips from wood screws can easily be distinguished for the reason that they are long and stringy and resemble those shown in Fig. 2. Leaded brass screw rod chips are short.

The manufacture of leaded brass screw rod chips calls for an exact mixture. If too much lead is used, the rod is apt to crack and pull apart in drawing. If too little lead is used, it will not cut sufficiently free. If too much zinc is used, the brass is too hard to draw and if too little is used, the rod is apt to be too soft *i. e.* it will bend in working unless very hard drawn. Leaded low brass and the bronzes are difficult to make and less lead only can be used.

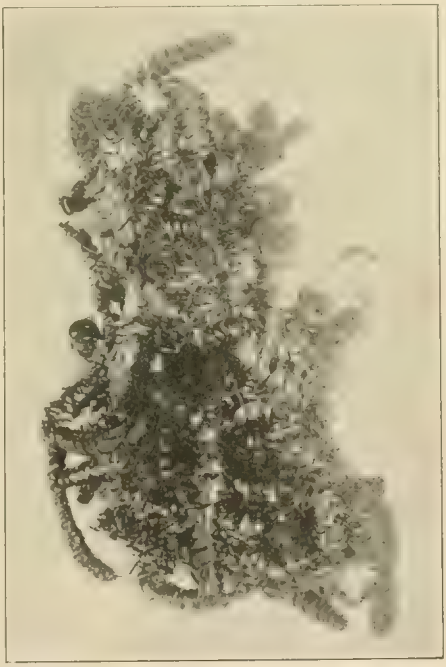


Fig. 2. Chips from Brass Rod Containing No Lead.

The favorite mixture for leaded brass screw rod is as follows:

| | |
|---|---|
| Copper | 62.50% |
| Zinc | 35.25% |
| Lead | 2.25% |

This mixture contains about as much zinc as it is possible to make and still have the rod draw well. If the lead content is also increased the rod will be refractory in drawing The amount of lead given has been found satisfactory for the majority of work. This mixture is the one in general use.

Screw rod is cast in a rod about 2 inches in diameter and 6 feet long. Some makers use a split mold and held together with clamps and wedges like the ordinary mold for casting brass, while others prefer the so-called "solid mold" *i. e.* one not split in the middle. The advantage of this mold is that there is no danger of one side of the mold lapping over on the other or the formation of fins. A good solid mold, however, is difficult to obtain and must be bored out.

The rod is then either rolled on three-high rolls or drawn on a draw bench. The draw bench to obtain the desired size and straighbut is not much used at the present except for finishing. The three-high rolls is the best practice. The rolling is done cold of course, as the rod is not susceptible to hot treatment.

The rods are annealed, on the way down as required, and are then finished on the draw bench to obtain the desired size and straightened. They are left hard as annealed rods would be too soft to work.

### *Screw Rods and Their Effect on the Scrap Metal Trade*

The enormous quantity of screw rods used in the trade for making small turned goods results in a corresponding amount of chips being produced. Strange to say, very little of such chips find their way back to the brass rolling mill that makes the chips for the reason that the mills do not care for them and will not pay the price that can be obtained from scrap metal dealers. The great outlet for such chips is in the manufacture of yellow brass ingot and it is excellent material, too, for the purpose. The chips are very uniform and contain about the right amount of copper and zinc for making castings. The lead should be increased to about 3%, but this is readily done. All that is necessary to do is to put the chips through a magnet machine to remove the iron and then melt them. In melting the waste is usually about 6 or 7 per cent.

One of the great advantages of screw rod chips is that they contain no aluminum and are free from any iron that cannot be removed by the magnet machine. As they can always be obtained, they comprise the chief source of supply in the manufacture of yellow brass ingot. Ingot makers who make the best ingot use them exclusively.

## Spotting-Out and Silver Plating.

In a paper presented on "Spotting-Out and Silver Plating", at the meeting of the American Institute of Metals held in Chicago, Ill., Oct. 13-17, C. F. Burgess and L. T. Richardson discuss the phenomenon of "spotting-out" and give the results of some experiments on the subject. Their work is directed towards the difficulty encountered in silver plating, which, by the way, is the least of any of the cyanide plating solutions. They fail to arrive at any particular conclusion.

They suggest that the presence of chlorides in the solution may have a direct influence on the spotting-out and having found that some grades of cyanide contain considerable chloride suggest that this may be the cause. In this connection it should be known that the largest concern in the United States carrying on silver plating now use and have used for years the chloride of silver for making up their plating solutions and they have very little trouble with spotting-out. It is believed, therefore, that the authors jumped at the conclusion in regard to the bad effect of chlorides for the reason that when chloride of silver is used, as it is in many instances, potassium or sodium chlorides are formed when it is dissolved in the cyanide.

The authors also believe that the use of potassium cyanide instead of sodium cyanide may be a cause on account of the deliquescence of potassium salts.

In connection with their experiments, the authors say:

"It appears that while potassium cyanide was formerly used almost universally by platers, sodium cyanide has been very generally substituted for it during recent years. This has been brought about largely through the lower cost and greater availability of this material. Sodium cyanide can be manufactured with a much greater percentage of the cyanide radical than is possible with the potassium. This is due to a difference of atomic weight of sodium and potassium. In other words, while platers formerly expressed the strength of pure potassium cyanide as 100 per cent., the corresponding pure sodium cyanide would have a strength expressed as 133 per cent. To bring the strength of sodium cyanide so that it is equal to that of pure potassium cyanide, the presence of additional ingredients is possible, and it appears that a very common grade of cyanide now supplied to electroplaters contains about 80 per cent. of cyanide, and about 20 per cent. of chlorides, probably in the form of sodium chloride or salt.

During the operation of the plating solution there is, especially in hot weather a gradual decomposition of the free cyanide necessitating a continual addition of fresh cyanide to keep up the strength, and this results in a marked concentration of chlorides in the solution after it has been used for some time. If the grade of cyanide containing 20 per cent. of chloride is employed there will be a gradual increasing proportion of the inert chlorides. While the writers have no definite knowledge as to whether the presence of these chlorides is advantageous or otherwise from the standpoint of the operation of the bath, it is possible that they may have an influence upon the spotting-out problem.

The writers distinctly recognize that these data are not absolutely quantitative or obtained under conditions insuring highest scientific accuracy. The rate at which moisture was absorbed from the air depends, of course, upon humidity conditions, and these conditions were not determined while the tests were made. In other words, if these same tests were made in the winter time the results might be materially different from those actually observed. Nevertheless, the data are significant in that they suggest a difference in properties as between potassium and sodium cyanides. The statements appearing frequently in literature that sodium salts are less deliquescent than the potassium, and will for this reason cause less spotting-out, are evidently misleading.

There is no doubt that the spotting-out problem is of sufficient importance to warrant even more careful investigation than has thus far been devoted to it and a part of this investigation should include a study of the relatie influence of the sodium and potassium cyanides. We cannot base a definite conclusion upon the mere fact that pure sodium cyanide attracts moisture more readily than does the similar potassium salt.

It is well known that during the operation of a plating bath the cyanides are gradually converted to carbonates. These carbonates may steadily accumulate in the bath, unless removed by the use of barium cyanide as a precipitating agent. Sodium carbonate is less deliquescent than is the potassium carbonate and we thus have a factor which may argue for the superiority of the sodium cyanide.

Another part of the investigation should include the observation of the accumulated chlorides which occur when the sodium cyanide containing 20 per cent. of chlorides is used or when the bath is kept up to strength in silver by the continual addition of silver chloride. If there were no removal of solution by entrainment on the work the chlorides would increase indefinitely and the strength which a silver plating bath will attain depends upon the method of operating the tank and the nature of the work."

## New Officers of the American Institute of Metals.

At the Meeting of the American Institute of Metals held in Chicago, Oct. 13-17, the following officers were elected:

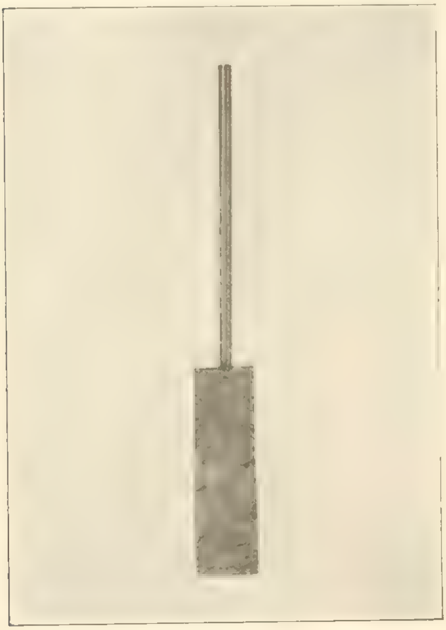
President, G. H. Clamer, Ajax Metal Company, Philadelphia.

Secretary-Treasurer, W. M. Corse, Lumen Bearing Company, Buffalo, N. Y.

Vice-Presidents: For rolling mills—W. H. Bassett, American Brass Company, Waterbury, Conn.; for Michigan and Ohio, F. O. Clements, National Cash Register Company, Dayton, Ohio; for Ontario and Western Canada, C. H. Ivey, Empire Mfg. Company, London, Ont.; for Quebec, Robert Job, Milton Hersey & Co., Montreal, Que.; for Pennsylvania, Jesse L. Jones, Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.; for New England, Dr. E. Weintraub, General Electric Company, West Lynn, Mass.; for Chicago and Wisconsin, Fred Moerl, Pullman Company, Chicago; for Illinois, exclusive of Chicago, Phillip Mueller, Decautur, Ill.; for New York and New Jersey, C. A. Finnegan, Empire Smelting Company, Depew, N. Y.; for Virginia and South, E. S. Fretz, Light Foundry & Mfg. Company, Pottstown, Pa. H. W. Gillett was appointed chairman of the Programme Committee.

## Holding Gold Anodes.

The majority of gold plating is done in a small way and with a small gold anode. It is necessary, of course, to hold the anode in some manner and the usual method is to punch a hole in it and fasten a piece of copper wire to the gold. While this method is efficacious, as far as holding the anode is concerned it is open to the objection that the wire must be kept out of the solution or a portion of the copper will be dissolved along with the gold. When a fine gold anode is used and no alloy can be tolerated, this dissolving of the copper will soon injure the solution and cause the gold deposit to become "off color." In addition, the full area of the gold anode surface cannot be used on account of this danger from copper contamination.

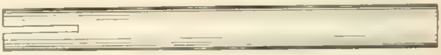


Method of Holding a Gold Anode with Steel Rod.

A gold rod, of course, would be satisfactory but this adds to the cost of the anode and in many instances the anode is, to the plater, quite an expense and economy is desired as far as possible.

A cheap and satisfactory method of holding a gold anode, no matter how thin, is by means of a soft steel rod. These rods may be purchased in any hardware store and are known as "Bessemer Steel Rods." They can be obtained in almost any diameter, but one about 3/16 in. in diameter is good, although it really makes no difference. If too small, however, it is difficult to cut the slot in the end.

Iron, it is well known, is not acted upon by cyanide and iron hooks and rods are used almost exclusively in silver plating for this reason. The use of the iron, therefore, will not be followed by any contamination of the gold solution as it is in the case of copper. An iron wire may be used, if desired, in place of the steel or iron rod, but in the case of a thin, sheet gold anode it is difficult to hold it as readily as by the method herein described.



The Slit Rod.

The method of holding the anode and one which will be found satisfactory and free from any danger of contamination of the solution, is to saw a slot in the end of the iron or steel rod so that the sheet gold will slip into it, and then hammer or squeeze down the ends so that the sheet gold is firmly held. In Fig. 1 is shown such a steel rod with the slot cut in it. This can be done by an ordinary back saw, but better yet is a small saw used by jewelers or silversmiths as it is possible, by this means, to obtain a narrower slot. When the slot has been cut, the gold is inserted and the end then squeezed down in a vise or hammered together so that the gold anode will be tightly clamped.

If the ordinary Bessemer steel rod is used, it will be found that it is copper plated in order to protect it from rust. This copper coating, however, is only a mere film and should be removed by a little scouring with emery cloth so that nothing but the bare steel will be exposed to the gold solution, otherwise there would be danger of contamination from the copper coating.

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In depositing the nickel from a black nickel solution, a weak current must always be employed. If the deposit comes gray, it indicates that the current is altogether too strong. If it comes with streaks upon it, it also indicates that the current is too strong although it will not need but a small reduction. To obtain a black deposit, with the regular strength of solution, 1 volt only should be employed.

## How to Electroplate with an Alternating Current.

The alternating current is now very extensively used for power and lighting for the reason that its transmission requires very much less outlay for copper conductors on account of the high voltage which can be employed. Nearly all new installations in central station work are equipped with alternating current generators. Both motors and electric lights can be operated by it with a facility equal to that of the direct current.

"**Wagner**" **Rectifier for Changing Alternating to a Direct Current.**

An alternating current, however, on account of its constant change in polarity, cannot be used for electroplating and for this purpose the direct current must be employed. Neither can storage batteries be charged direct from an alternating current as this, too, is analagous to electroplating and the change in polarity renders such a current valuless for charging the battery.

In order to carry on electroplating, or charge a storage battery by means of an alternating current, it is necessary to change it to a direct current. When the alternating current first began to be used, the apparatus used for this purpose was expensive and complicated, but a new and inexpensive form of instrument has recently been placed on the market by the Wagner Electric Mfg. Co. of St. Louis, Mo. and which is called an "Alternating Current Rectifier." This rectifier is herewith illustrated and is quite compact and simple. It consists of an electromagnet, the armature of which is a flat spring held at one end, but free to vibrate in front of the magnet core. This magnet is so constructed that it attracts the armature once for every cycle of the supply frequency, and at each attraction a contact is made which allows part of the alternating current wave to go through the battery. If connections were continued through the reverse current wave, the battery (storage) would discharge. The rectifier armature however, is released at the instant that the voltage of the battery equals the voltage of the alternating current wave, so that the battery cannot discharge by allowing the reverse wave to flow through. The rectifier armature, therefore, traps, so to speak, a part of each similar half of the alternating current wave and stores it in the battery.

The rectifier herewith illustrated is intended for charging small storage battery cells, but larger instruments are made for heavier currents. In the case of the instrument shown, it is simply connected to an electric light socket and the storage battery is then connected, by means of the binding posts, to it. It is necessary, of course, to connect the battery poles correctly.

To electroplate by means of the alternating current, a storage battery should be used and correctly connected, in respect to polarity, to the rectifier. Wires are then run from the battery to the plating tank. The battery will then be "floating" on the line and take care of an irregularity in the current flow. A rheostat, of course, may be interposed between the battery and the plating tank for cutting down the current.

As it is frequently desired to electroplate in a small way by means of a lighting current, and nearly 90 per cent. of all central stations are now using the alternating current, this new rectifier will be found very useful for such work.

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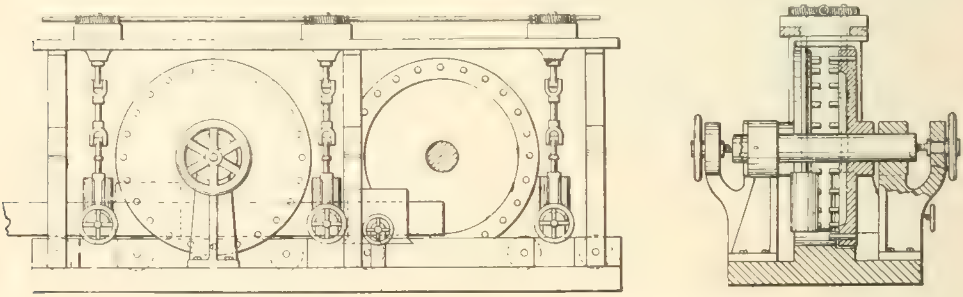
The best babbitt-metal hammers are those made from a genuine babbitt metal of which tin is the base. The so-called lead-babbitt-metal hammers are not as serviceable for the reason that they crack in service if made as hard as they should be.

## A New Machine for Overhauling Brass.

In casting brass for rolling into sheet, the metal is poured into iron molds which, although producing a smooth surface on the metal, does not leave it in a condition for rolling. The surface always contains more or less imperfections in the form of dross, particles of carbon, etc., which must be removed before rolling, otherwise they would roll into the brass and cause trouble.

In order to remove this foreign matter, resort is had to an operation called "overhauling" which is nothing more or less than scraping. Formerly, this was done by hand, but of late years it has been done by large and powerful machines on which a tool like the old-fashioned hand tool, is drawn over the metal and by means of greater or less pressure, it is possible to dig into the brass to any depth that may be desired to remove an imperfection.

A new machine for overhauling brass has recently been patented by C. S. Vosburgh[*] and Joseph L. G. Blair in which the old fashioned principle of scraping has been eliminated and rotary cutters employed. It has been found more economical to take a uniform cut all over the bar, even though the amount of chips formed is greater, than to use the comparatively slow method of scraping. The machine is illustrated in Figs. 1 and 2.



Sketch Showing Method Used for Cutting on Overhauling Machine.

The cutters are arranged in a rotary head so that they may be removed when necessary to sharpen them. These heads are made adjustible so that they may be applied to the bar being treated, to the desired degree.

The bar to be overhauled is fed into the machine upright so that both sides are overhauled at once and issue from the other end in a condition ready for rolling. One of the great advantages of the machine is that unskilled labor only is required and the output will be, the inventors say, about 20 times that of the regular overhauling machine. An additional feature of the machine is the fact that the chips are fine and do not clog the mechanism and are much more convenient t collect and remelt than ordinary chips. After they have been cut from the bar on this machine, they drop down through the bed into any convenient receptacle ready for transportation back to the casting shop.

## The Over-Production of Cobalt.

Although cobalt has long been known, on account of its sparing use in the arts, it has been imperfectly understood. Until the past year or two, there had been no use at all for metallic cobalt and the oxide, employed for coloring glass and pottery, was the only use for it. The law of supply and demand, apparently regulated this matter, for there was not a great quantity of cobalt produced and the demand was equal to the supply. The opening of the mining region in Canada known as the "Cobalt District" has apparently thrown a new light upon the matter as large quantities of cobalt are produced from this region and more can be obtained should the occasion demand it. It can be said that there is an overproduction of cobalt and that the supply is greater than the demand.

Cobalt is a metal very similar in its properties to nickel and side by side they have almost exactly the same appearance. Cobalt has a slightly reddish tint, although it is not very perceptible. In chemical properties cobalt closely resembles nickel except that its salts are pink or red while those of nickel are green. Cobalt can be electrodeposited in the same manner as nickel from a double sulphate of nickel and ammonia. The deposit has the appearance of a nickel plate.

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[*] 848 Noble Ave., Bridgeport, Conn.

In alloys, however, cobalt seems to have greater hardening properties than nickel and it is quite probable that at an early date a large use for this metal will be found in the metallurgical field of alloys. Some very interesting alloys have already been produced in the shape of combinations of cobalt, chromium and tungsten and which are used in place of steel for cutting tools. They have given some remarkable results in the cutting of metals. A recent use for cobalt is in steel and this would seem to open up a very large field for the metal. The steel industry, when it enters the field, is a large consumer of metals.

While cobalt is, at present, in the state of overproduction, it would appear that within a short time a large demand would be created for it which will take all the supply that can be produced.

## Method of Making Tungsten Filaments.

The enormous use of the tungsten lamp at present renders any new developments in the manufacture of the tungsten filaments of interest. Contrary to the usual belief, the tungsten filament in an electric lamp is not made from wire in the usual manner by drawing it from solid metal. Owing to the high melting point of tungsten (the highest of any metal) this has been found impossible. The tungsten, as commercially produced, is in the form of a powder, and this, of course, cannot be made into wire except by a round-about way. The method employed is to mix this powdered tungsten or the oxide with a plastic material, such as glucose, squirt through a die to form wire and this wire is then heated to remove the carbon and give a homogenous and ductile material.

Charles A. Hansen of the General Electric Co. of Schenectady, N. Y. has recently patented a method of making a wire for a tungsten lamp filament which may be assumed as the standard process of producing such material, inasmuch as the General Electric Company is the largest manufacturer of tungsten lamps in the world. The process is described as follows:

"In applying my invention to practice, I produce a squirting mixture containing a reducible compound of the refractory metal, such for instance as oxide, and I reduce this oxide by heat treatment in the presence of hydrogen or other volatile reducing agent under low pressure. I consider that the pressure of the reducing agent has an important bearing on the reduction, and furthermore, has a very important bearing on the proportion of carbon left in the product, whether that carbon rises as an impurity in the oxide or comes from the binding material used when the oxide is squirted. If tungsten trioxide is used I prefer to mix with it a decomposable carbonaceous binding material, such for instance as glucose, which may be subsequently disintegrated or decomposed by heat. Glucose is, however, only one of many binding materials which are suitable for this work, and I have obtained very satisfactory results with a binder containing glucose, starch, and glycerine. The glycerine prevents rapid drying of the mixture,—the starch gives it smoothness, and the glucose gives it strength for squirting.

These ingredients may be used in the following proportions:—Tungsten trioxide—39.8 parts by weight; glucose—1.2 parts; starch—1 part, and glycerine—3 parts. This mixture when squirted gives a good smooth thread which may be readily wound on a form and otherwise manipulated to produce filaments or incandescing conductors of the desired shape.

The next step in my process consists in baking the raw filaments in an ordinary muffle furnace at about 150° centigrade for ten minutes; this is to dry the filaments and stiffen them. I next carbonize the filaments for ten minutes in a muffle furnace operated at approximately 300° centigrade. During this treatment the raw filaments may be mounted on a form of graphite which may be covered with pure tungsten, or they may be otherwise supported for convenient transfer in bulk from one muffle or furnace to another. I next place the graphite form with its load of carbonized filaments in a graphite crucible and fire in a resistance furnace in an atmosphere of hydrogen at a pressure of about 20 m. m. of mercury.

I estimate that the temperature of this treatment is in the neighborhood of 1200° centigrade, and I believe that the low pressure of the hydrogen accounts for the activity of the reduction at this temperature. I prefer to bring the firing temperature up rapidly to a point above the temperature at which carbon reduces tungsten trioxide. I next pump out all the hydrogen from the furnace and increase the energy input to about 7 kilowatts and continue the heating operation for about one hour. I estimate that the temperature under these conditions is in the neighborhood of 2200° centigrade and I believe that no carbon remains in the filament after this last treatment, for I find that filaments which have been so treated may be run for some time at a current consumption as low as .3 of a watt per candle. I think it very possible that by working under reduced pressure, the activity of the carbon as a reducing agent is much increased and the temperature of reduction is lowered. This probably accounts for the fact that the reduction product is free from carbon and well suited for use in lamps.

Lamp filaments produced as above described may be mounted directly in the lamp, though if desired they may be first mounted on the lamp stem and then given a preliminary heat treatment in an evacuated treating chamber or in an inert gas, by passing current through the filaments to shrink them and put them in better condition for continuous operation in the lamp.

## Use of Nickel in Improving the Properties of Sheet Brass.

According to L. Guillet in *Rev. Met.* the mechanical properties of sheet brass are improved by the addition of a small amount of nickel. He says:

"Nickel by reason of its negative coefficient of equivalence is the most efficient of the metals yet examined for raising the 'imaginary percentage' of copper in brass, *i. e.* a brass containing a certain percentage of nickel, in addition to copper and zinc, is similar in mechanical properties to an ordinary brass of higher copper content than would be the case if the nickel were replaced by another metal. Other things being equal, the addition of a small percentage of nickel makes a brass easier to work cold."

## New Furnaces for Melting Soft Metals.

The ordinary method of melting soft metals, such as solder, babbitt-metal, type-metals or similar low melting metals is by means of an iron kettle heated by a coal fire. The metal is ladled out into the molds as required by means of an iron ladle. The metal, therefore, is taken from the top where the dross accumulates. Two new forms of furnaces for melting soft metals have recently been patented:

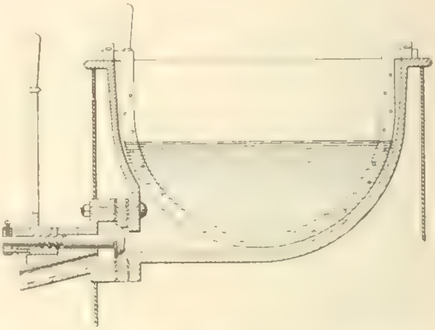


Fig. 1. "Sheehan's" Bottom Poured Kettle for Soft Metals.

In the patent of Thomas C. Sheehan of the Automatic Furnace Company of New York City, means are used for stirring or puddling the molten metal. This is accomplished by means of a hand device curved to correspond to the bottom of the kettle and when manipu-

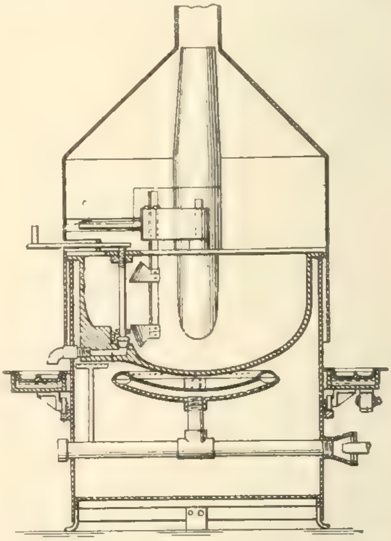


Fig. 2. Morrell's Melting Kettle for Soft Metals.

lated agitates the metal as desired. The pouring of the metal is accomplished by means of a bottom gate operated as shown in Fig. 1. The molds are placed under the spout and, by means of the handle, the gate is opened and the molds filled in succession. The apparatus is, it is stated, particularly applicable to the casting of linotype and monotype metals.

The melting furnace patented by Thomas W. Morrell of Bloomfield, N. J. is also designed for soft metals. A stirrer with fan shaped blades is used in the interior of the kettle for stirring the melted metal and the pouring is done from the bottom as indicated in Fig. 2. The molds are arranged on a turn table around the furnace so that each one may be moved in succession to the pouring spout and filled. Gas is used for the fuel.

## Material for Foundry Floors.

It has always been difficult to produce a satisfactory foundry floor without considerable expense. Dirt, which, of course, means molding sand is satisfactory in one way but not in others. It must be kept wet and, unless the sand is constantly leveled off to the right height, the floor becomes quite uneven.

Brick is not very satisfactory and ordinary concrete is unsuitable for the reason that hot metal will crack it. Iron floor plates, when made sufficiently thick and large are excellent and are used very extensively in the large brass rolling mills, particularly in the casting shops. The objection to their use has always been one of cost.

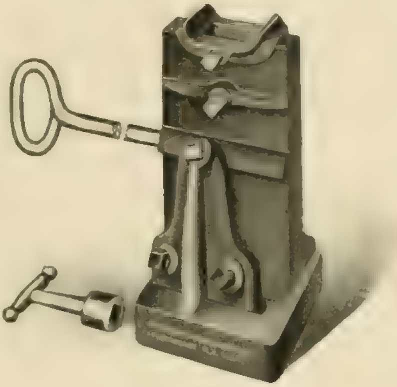
The following concrete mixture, it is stated, has been found quite satisfactory for foundry floors and is the result of considerable experimenting on the subject. This mixture is as follows:

| | |
|---|---|
| Cement | 1 part |
| Sand | 3 parts |
| Gravel | 4 parts |
| Iron Borings | 1 part |

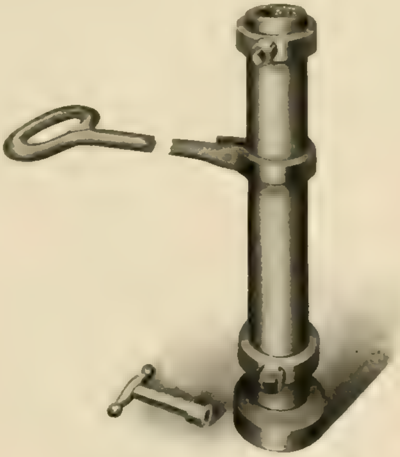
The iron borings, of course, is the novel part of the mixture. It is stated that molten metals do not crack or disintegrate the floor.

## Ingot Molds for Casting Silver or Gold.

Silver and gold, and their alloys, to be rolled into sheet or drawn into wire or tubing, must be cast in iron molds. As so much is expected of these metals, in the way of freedom from imperfections, too much care cannot be exercised in obtaining suitable molds for the purpose. Poor molds frequently mean poor cast ingots and the rolled or drawn metal made from them will likewise become imperfect.



Ingot Mold for Flat Bars.



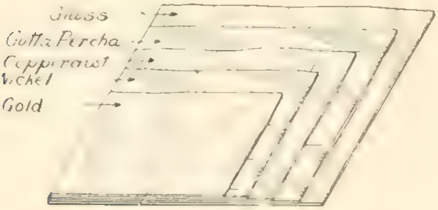
Ingot Mold for Round Ingots.

In casting silver or gold for rolling into sheet, a large variety of sizes are frequently required and, under ordinary conditions this would mean an equal number of molds of the desired width. It is now possible, however, to obtain adjustable molds so that ingots from half an inch in width up to six inches can be produced. The mold used for this purpose is shown in Fig. 1 and, it will be noticed, is supplied with a base upon which the mold rests. The halves of the mold slide past one another, being held by set screws, so that the width of the cast ingot may be varied. The mold is supplied with a rest for the crucible at the top of the mold. These molds are made in sizes up to 12 inches in height and to give a cast ingot from ½ to 6 inches in width.

For casting round ingots for drawing into rod, wire or tubing, the mold shown in Fig. 2 is used. This is supplied in varying sizes and is supplied with clamps as indicated in the illustration. A handle is supplied for holding the mold while pouring and for manipulating it when hot. Both the flat and round molds are made with planed surfaces to give the best possible surface to the ingots. These molds are made for the trade by the Standard Machinery Co. of Providence, R. I.

## A Substitute For Gold Leaf.

A substitute for gold leaf has recently been devised by an Englishman. The leaf is intended to be used in the bookbinding and similar trades. The method of making the substitute is as follows: A glass plate is first coated with a thin layer of gutta-percha. When dry it is brushed over with a layer of copper powder to render it conductive. A layer of nickel or silver is then deposited on this and then gold is electrically deposited on this surface. The gutta-percha is afterwards removed by a solvent.



Method of Making the Gold Leaf.

Early electrolytic copper was quite impure and this fact was the reason why it did not meet with the approval of the trade. It was so impure that sheet brass could not be made from it and for a considerable length of time it was used only for sand castings

## Zinc Alloy for Rolling into Sheet.

According to a patent* recently issued to Thomas A. Bayliss of Warwick ,England, a superior zinc for rolling may be produced by the addition of a small quantity of aluminum and lead to pure zinc. The proportions are as follows:

| | |
|---|---|
| Zinc | 99.85% |
| Aluminum | 0.10% |
| Lead | 0.05% |

A preferred method of manufacturing the alloy according to the present invention is as follows:—The zinc and lead are melted in a pot or furnace closed to avoid oxidation. The temperature is raised to and maintained between 350—450° C. to bring the zinc and lead into a molten condition and, while the zinc and lead are still in a molten condition, the aluminum is then added in a solid or molten state to make the composition required. When the aluminum has become evenly disseminated throughout the mass and the several components are melted and intimately mixed together ready for pouring, the metal is fluxed with ammonium chloride or other suitable flux, skimmed and poured into molds to form slabs suitable for rolling. The alloy cools and sets in the mold and when a sufficiently low temperature has been reached (about 150-200° C.) the slabs are submitted to their first rolling. Sheets are thus made of convenient size according to requirements and subsequently annealed at a temperature of 200-250° C. in a furnace suitably arranged and heated for that purpose. This annealing, which may be repeated as required, gives the requisite heat for subsequently rolling the sheets to the required dimensions and the final annealing operation follows under similar conditions. The metal thus obtained is extremely tough and strong and is malleable and suitable for stamping and like purposes, or for strip, wire and the like. It may be rolled into long lengths such as lengths of 100 ft. or 200 ft. or the like suitable for commercial requirements.

*U. S. Patent, 1,074,234, Sept. 30, 1913.

## Melting Points of the Brass and Bronzes.

The melting points of the brass and bronzes has always been a subject upon which little investigation has been done. The results given in the various text books and treatises on alloys are both notoriously inaccurate and misleading for the fact that, in the majority of instances, the composition of the alloy is not given and the determination of the temperature of melting was not accurately determined, probably on account of the lack of suitable apparatus for this purpose.

In a paper on "*The Approximate Melting Points of Some Commercial Copper Alloys*" presented by H. W. Gillett and A. B. Norton at the Chicago meeting of the *American Institute of Metals*, some valuable data on the melting points of the commercial brasses and bronzes are given. The melting points were very carefully determined by the authors and the results are valuable contributions to science. The following results were obtained:

| Alloy | M. P. | M. P. | Composition |
|---|---|---|---|
| Gun-Metal | 995°C. | 1825°F. | 88 % copper. 10% tin, 2% zinc. |
| Leaded Gun-Metal | 980°C. | 1795°F. | 85½% copper, 9½% tin, 2% zinc, 3% lead. |
| Red Brass | 970°C. | 1780°F. | 85 % copper, 5% tin, 5% zinc, 5% lead. |
| Low Grade Red Brass | 980°C. | 1795°F. | 82 % copper, 3% tin, 10% zinc, 5% lead. |
| Lead Bronze | 945°C. | 1735°F. | 80 % copper, 10% tin, 10% lead. |
| Bronze with Zinc | 980°C. | 1795°F. | 95 % copper, 10% tin, 5% zinc. |
| Half Yellow & Half Red | 920°C. | 1690°F. | 75 % copper, 2% tin, 20% zinc, 3% lead. |
| Cast Yellow Brass | 895°C. | 1645°F. | 67 % copper, 31% zinc, 2% lead. |
| Naval Brass | 855°C. | 1570°F. | 61½% copper, 37% zinc, 1½% tin. |
| Manganese-Bronze | 870°C. | 1600°F. | Composition not given. |

The composition of the alloys given are those used to make the mixture. Analyses were made of the finished alloys and they corresponded very closely with the desired formula. The compositions indicated by the mixtures can, therefore, be used for commercial purposes.

A coating for protecting iron patterns from rust is composed of 1 pint of turpentine, 1 gallon of paraffine oil and sufficient of vegetable black to render it thick like ordinary paint. The mass is rubbed on the pattern and it is stated that they have been used over fifty times, when treated with this compound, and still were as smooth as new.

## High Temperatures as Indicated to the Eye.

The naked eye has always been the means employed for indicating high temperatures such as the melting of metals or heating them for rolling or forging. Until the pyrometer made its appearance the eye was the only method employed for determining the temperature. While more or less inaccurate and susceptible to the personal equation, the eye is still used in the majority of cases. The following table will serve to indicate the temperature of a body as shown by its color:

| | C | F |
|---|---|---|
| First Visible Red | 525° | 977° |
| Dull Red Heat | 700° | 1292° |
| Turning to Cherry | 800° | 1472° |
| Actual Cherry Red | 900° | 1652° |
| Bright Cherry Red | 1000° | 1832° |
| Dull Orange | 1100° | 2021° |
| Bright Orange | 1200° | 2192° |
| White Heat | 1300° | 2372° |
| Bright White Heat | 1400° | 2552° |
| Dazzling White Heat | 1500° | 2732° |

This table is after that of Pouillet and the color will depend upon the person, as judged by the eye, and which is more important, the surroundings. In bright light a color will not be as intense as in the dark. It is for this reason that a gas flame appears yellow in daylight and white at night. In judging heats or temperature by the color, the conditions of lighting should always be the same, otherwise there is apt to be a considerable variation in the estimation. In judging the heat of molten metal and which is supposed to be at the right pouring temperature, a strong light on it will cause it to appear at a much lower temperature than were it to be poured in the shade or dull light.

## Making Insulated Copper Wire or Aluminum by Means of Oxide of Aluminum.

For use in winding motors, etc., it is customary to insulate copper wire of a fine gauge by means of silk or other textile material. This involves expense and the covering takes up considerable room.

While it is impossible to deposit aluminum on metals electrolytically, it has been found that the oxide can be deposited and a insulation thus produced. Two inventors have patented a method of producing this oxide insulation almost simultaneously. Jacques Loewenthal of Berlin, Germany has patented the following method and his process is as follows:

"As is well known solutions of aluminium salts cannot in a cool state be used for depositing metallic aluminium electro-chemically, but compounds of aluminium and particularly aluminium oxide can be produced in that manner. According to the present invention this fact is utilized for coating conductors of any desired form or property such as copper wire with an electrically insulating layer. To this end the conductor is treated electrolytically as negative electrode in a bath containing aluminium salt. By suitably selecting the composition of the bath and the current used, a firmly adherent coating of aluminium compounds particularly of aluminium hydroxide and forming a sound and fire proof insulator is obtained on the conductor. The aluminium hydroxide can be converted into aluminium oxide by the action of heat.

For the purpose of carrying the process into effect solutions of aluminum salts may be used such as are for instance described in the scientific literature more especially in connection with the analytical separation of aluminium in the form of hydroxide. A suitable bath is for example that suggested by A. Classen and consisting of a solution of aluminium-ammonium oxalate with an excess of ammonium oxalate. From this bath the aluminium is precipitated on the cathode in the form of hydroxid under the action of the current to the extent to which the ammonium oxalate is converted into ammonium carbonate. For practical purposes for example an aqueous or slightly acidulated solution of aluminium sulphate neutralized if desired by means of ammonia is treated with an excess of ammonium oxalate, adding with the application of heat, if desired, solid ammonium oxalate so that two to three grams of ammonium oxalate are used for each 0.1 gr. of the metal. The strength of the current is so chosen as to produce a violent decomposition of the oxalic double salt. The conductor thoroughly cleaned is immersed in this bath and used as a cathode, the anode consisting of any desired conductive substance which is not attacked by the liquid of the bath such as platinum. The shape of the anode is by preference as nearly as possible that of the conductor so that the distance between all points of the surface of the conductor and the nearest point of the anode is the same as nearly as possible. From this bath the aluminium is precipitated in the form of hydroxide which very firmly adheres to the conductor.

An exceedingly suitable example for treating sheet metal or metal wire such as copper wire or copper band, is as follows: The metal such as copper sheet or copper wire to be coated with aluminium oxide is first of all carefully cleaned by the removal of the fatty layer adhering to it. This is effected by means of benzol, ammonia, spirit or the like and subsequently etching it with acid or other corrosives. By preference the etching is effected electrolytically by placing the copper body for instance in a bath of sodium acetate to which a little free acetic acid has been added and connecting it to the positive pole of a source of current, the negative pole being attached to a copper sheet acting as cathode and annularly surrounding the copper body to be etched. After the etching operation the copper body is brought into a second solution without previous rinsing. This second solution consists of aluminium acetate (for example 8%) to which nitrate of mercury has been added. The quantity of nitrate of mercury added may for instance be such that the contents thereof in the solution amount to about 0.1%, fresh mercury salt being added from time to time. In this bath the copper body forms the cathode and the anode is made to annularly surround the same. For the anode lead with lead-peroxide is preferably used. This may be obtained by treating lead sheets as anode in sulphuric acid of about 25% with moderately strong current for some time. In the bath of the aluminium salt the aluminium oxide or hydroxide is now precipitated on the copper. Good results can be obtained with a terminal tension of 24 volts and with a current density at the cathode of at least 0.1 to 0.5 amperes per square centimeter surface. In order to increase the firm adhesion of the precipitate the liquid is strongly agitated during the action. This may conveniently be effected by blowing in air between the anode and cathode for instance with the aid of a pipe extending into the interior of the annular anode. This pipe may consist of nonconductive material and for the treatment of wire or band may simultaneously serve as a guide for them. After the electrolytic treatment, which may be completed in about half a minute, the copper is rinsed and then heated to dryness, without glowing. If, after one treatment, there are places, to which the precipitate does not adhere, it can usually be traced to grease on the wire before treatment.

The other patent is that of Lewis W. Chubb of the Westinghouse Electric & Mfg. Co. of Pittsburgh, Pa. The coating of oxide of aluminum in this patent is used upon aluminum wire and his process is described in the following manner:

My invention relates to the coating of wires and other electrical conductors for the purpose of insulating their surfaces and it has for its object to provide a process and an apparatus for continuously and effectively applying very thin fireproof insulating coatings to such conductors as are suitable for use in the construction of coils for electrical apparatus.

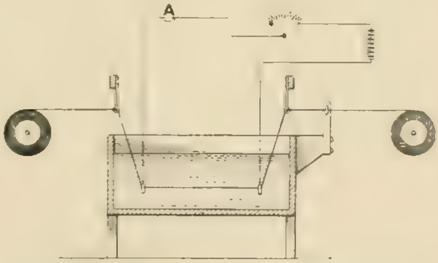
The usual windings of small motors and other electrical apparatus, which embody large quantities of small gage wire having cotton or silk insulating coverings, are unduly expensive and also occupy an excessive amount of space by reason of the thickness of the insulating coverings. By employing my process and apparatus, the expense of manufacture and the space occupied by the insulated conductor may be greatly reduced.

It is a well known fact that an electrolytic valve action may be produced in a cell comprising plates of aluminum, copper, cobalt and a few other metals when immersed in a suitable liquid, such as a solution of ammonium borate or a solution of borax and, furthermore, it has been found by repeated tests that the plate which acts as a valve will readily permit the flow of an electric current at a voltage only slightly above a predetermined amount, while it will act as a substantially perfect barrier to currents at a less voltage. This predetermined voltage is dependent upon the material of which the plate is constructed and the solution in which it is immersed. While certain metals, when treated as above indicated, are capable of resisting only relatively low voltages, aluminum, under the same conditions, will become coated with an insulating film which is capable of resisting relatively high voltages.

By utilizing the principle of the electrolytic valve, I have devised a continuous process for producing very thin insulating films on the surfaces of aluminum wires and other conductors which are capable of successfully resisting such electromotive forces as exist between the turns of filed magnet coils of dynamo-electric machines and other windings and an efficient means for practising the same.

## A Method of Drawing Refractory Wires.

A method of drawing wire of a refractory metal, such as tungsten, has recently been patented by A. J. Liebman of New York City.



Apparatus for Drawing Refractory Wire.

The wire is passed through a benzine bath or other hydrocarbon and passing over two electrical contacts is heated red hot. This causes it to become coated with carbon which assists the drawing through the diamond die.

For galvanizing small articles, electrogalvanizing can be done much more cheaply than by the hot process.

## Electrolysis of Aqueous Solutions of Simple Alkaline Cyanides.

At the September Meeting of the *American Electrochemical Society,* held in Denver, Sept. 9-11th., a paper with the above title was read by G. Howell Clavenger and Mortimer L. Hall. They carried a series of investigations on the reactions taking place during the electrolysis of cyanide solutions, and while applied more particularly to the mining industry, in which cyanide solutions are used, the effect is the same as in electroplating.

In electroplating with cyanide solutions, the cyanide becomes changed to other compounds. Some of the statements in the paper are as follows and will indicate that changes take place during the passage of the electric current through a cyanide solution:

"Schlagdenhauffen (1863) states that ammonia, carbon dioxide and possibly cyanate are the products of the electrolysis of a cyanide solution. Kalbe states that ammonia, carbon dioxide and cyanate are the products formed by the electrolysis of a cyanide solution. Allen says that the cyanate is formed at the anode by the electrolysis of the corresponding cyanide. Paterno and Pannain, in the course of their work of finding the most favorable conditions for the oxidation of potassium cyanide to cyanate electrolytically, ascertained the following: *First,* a concentration of potassium cyanide of between 4 and 6 gram mols. per liter; *second,* the presence of 1 gram mol. of potassium hydroxide per liter; *third,* a voltage of 4 to 6; *fourth,* a current density at the anode of 9.3 to 37.2 amperes per square foot (100 to 400 amperes per square meter; *fifth,* agitation of the solution at the anode.

A solution containing 72 grams of potassium cyanide, when electrolyzed under the above conditions, yielded 32 grams of the purest cyanate which precipitated out during electrolysis, while 49 grams remained in solution. There also remained in solution 2 grams of undecomposed potassium cyanide. The cyanate produced was 90.3 per-cent of that theoretically possible from 72 grams of cyanide, and 92.8 per-cent of the 70 grams of cyanide actually decomposed. When maintaining the above conditions except that the potassium hydroxide was omitted, the solution assumed a reddish-brown color and there was deposited an amorphous brown substance. Even in the presence of potassium hydroxide the solution showed this brown coloration, unless it was agitated at the anode.

The decomposition of the fresh solution, upon standing, appears to be largely due to contact with air, for the reason that when the bottles were completely filled with solution there was little or no decomposition.

*Conclusions.*

1. The bulk of the decomposition of cyanide occurring during electrolysis is due to oxygen liberated at the anode through the decomposition of water.

2. The principal final reaction in solutions of cyanide containing protective alkalinity, which in cyanide mill practice is usually due to lime, is the formation of the corresponding alkali carbonate. This accounts for the formation of large amounts of calcium carbonate during the electrolytic precipitation of gold and silver from cyanide solutions.

3. A consideration of the reactions previously discussed will explain the failure in many cases to obtain regeneration of cyanide when such regeneration is theoretically possible. It is apparent that the decomposition of cyanide may easily be equal to or greater than that regenerated through the precipitation of the metal in solution.

4. The Lebig titration for the estimation of cyanide in an electrolyzed solution gives results which are low.

5. The changes taking place in fresh and electrolyzed cyanide solutions, upon standing, are different.

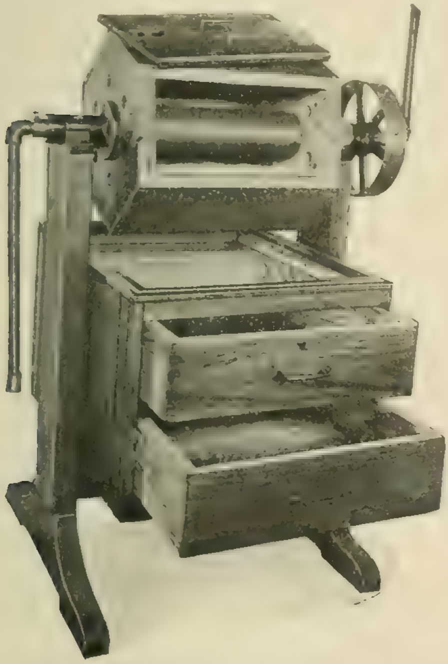
6. While not wishing to discourage investigators working along the lines of aiding extraction with refractory ores by electrolysis, we think that it is of importance to call attention to the disadvantages which may arise through the indiscriminate use of electrolysis with an ore pulp. First, a large loss of cyanide may result from which there is no benefit derived, and, second electrolysis may actually interfere with extraction through the formation of a coating of calcium carbonate upon the ore particles."

---

An alloy of cobalt and tin in the proportion of about equal parts of each is stated to be very acid proof and even withstands aqua-regia. The alloy is too brittle for use, however.

## A New Drying Out Machine for Treating Small Metal Goods.

The drying-out of small metal goods has always been more or less of a problem. It does not pay to put too much hand labor on them and any machine which will expedite matters is an advantage. A new machine for drying-out this class of work has recently been constructed and placed on the market by the Smith, Richardson Company of Attleboro, Mass. and which is called the "Richardson Drying-Out Machine." This machine is herewith illustrated.



The New "Richardson" Drying-Out Machine.

The drying-out of jewelry, buckles, clasps, screws, rivets, and, in fact, all classes of metal goods which must be dried, can be done in the machine very advantageously. The goods are placed in barrel with sawdust. A steam drum inside keeps the sawdust hot so that drying takes place at once. The goods are then tumbled a short time to conclude the drying. The cover of the barrel is then removed and the contents dumped into the sieve. The sawdust falls through the sieve into the boxes below from which it is transferred to the barrel again for further use. The articles are left in a clean and dry condition in the sieve.

## Melting Platinum.

Platinum is now so extensively used in the manufacture of jewelry that manufacturers frequently desire to melt their own scrap, but to do this several things must be taken into consideration.

Platinum is very susceptible to foreign metals and, while it may be possible to melt it, it will frequently be found that the cast metal will not roll. One manufacturing jeweler made the following remarks about the platinum he has melted:

"I have been melting platinum in melts of several ounces each in the form of both flat and curved bottom shapes using an oxy-hydrogen blowpipe, the platinum being cleaned scrap. On rolling out the platinum it frequently cracks badly on the top surface (in particular), develops checks or streaks, either from the top surface or the interior of the melt."

The presence of foreign metals, such as silver, gold or silver-solder was probably the cause of the cracking of the platinum. Another reason is the melting of too large masses so that the cooling does not take place rapidly enough. In melting the platinum it is customary to use a block of lime for the crucible and this is hollowed out to hold the metal. An oxy-hydrogen blowpipe flame is brought to play upon the metal which soon melts. Some platinum melters prefer to allow the molten platinum to cool in the cavity in the lime, rather than attempt to pour it.

If the platinum scrap is impure, as it frequently is when a miscellaneous assortment is used, it can only be refined in the wet way as there is no known method of refining it in the crucible as gold or silver is treated.

Spotting-out on copper or brass plated work may be caused by the blistering of the deposit. The blisters hold plating solution underneath and this gradually works out corroding the surface around the blister.

Making large melts for casting metal for rolling is not attended with as good results as with small ones. The reason is that the large quantity of metal takes too long to melt and the result is that it is exposed to the air and products of combustion for such a time that the metal is injured.

# Questions and Answers.

Question No. 1377. Please advise us if there is any method of hardening drawn sheet aluminum goods after they come out of the press. We have been unable to make these goods as stiff as some found in the market and it has occurred to us that possibly there is some method of stiffening them after they have been drawn.

*Answer.* There is no method for hardening the sheet aluminum. The goods you mention must have been made from a hard aluminum sheet which is made by alloying pure aluminum with a little copper before rolling. This produces a sheet that is stiffer than pure aluminum and which, of course, will produce a stiffer article after it come from the press.

Question No. 1378. In sand blasting brass castings we accumulate quite a lot of waste sand that is not suitable to use over again. Is there brass enough in this to pay to sell.

*Answer.* There is such a small amount of brass in the sand that it would not bring anything for copper contents. It will not run 5 per cent of copper and this is almost too small, unless in close proximity to a smelter, to pay the freight.

Question No. 1379. How is oxide of tin made and what is it used for?

*Answer.* Oxide of tin can be made in two ways. First, by melting the tin and exposing it to the air. The oxide is then ground up. We believe that most of the oxide is made in this manner. The other method is to treat the tin with nitric acid which oxidizes it but does not dissolve it. The white power thus obtained is heated to convert it into the oxide. The principal use of the oxide of tin is in the manufacture of the enamel used on enameled utensils, bath-tubs, etc. It is also used for making putty and is often called putty-powder.

Question No. 1380. What is the mixture of bronze known as "Plastic Bronze." Also what is the best alloy to use for bushings in an automobile?

*Answer.* "Plastic Bronze" is an alloy patented and made by the Ajax Metal Company of Philadelphia. It consists of the following:

| | |
|---|---|
| Copper | 64% |
| Lead | 30% |
| Tin | 5% |
| Nickel | 1% |

For automobile bushings a rather hard bronze is necessary and the following is good:

| | |
|---|---|
| Copper | 85% |
| Tin | 10% |
| Lead | 3% |
| Zinc | 2% |

Question No. 1381. I am nickel plating a lot of hardware hinges and am having a great deal of trouble with them. I find my nickel deposit very hard and have a hard time buffing it to a good color. I have a good finish on the hinges before they are plated. A friend of mine suggested that I use a little boric acid in the solution and carbonate of nickel. I am now using nothing but regular double and single salts. What is the trouble?

*Answer.* We should say that your current is too strong. It is possible to produce hard nickel without its actually showing the burning marks. Possibly your solution has become too concentrated by evaporation and thus the conductivity has increased and more current will pass at a given voltage. Your solution should not stand over 7 degrees Beaumé. The addition of about 2 oz. boracic acid to each gallon of nickel solution will tend to produce a soft deposit. It will have to be dissolved in the solution that is hot as it is only slightly soluble when the solution is cold. After it is once dissolved it will not separate out when the solution cools.

Question No. 1382. When filling an order for eccentric stems for a thermostatic injector, the specifications calling for phosphor-bronze, we used a mixture which on analysis showed the following:

| | |
|---|---|
| Copper | 87.60% |
| Lead | [illegible] |
| Tin | 4.00% |
| Zinc | 4.30% |
| Iron | 0.50% |
| Phosphor Tin | 0.14% |

Customer was [illegible] that the mixture should be:

| | |
|---|---|
| Copper | 90% |
| Phosphor Tin | 10% |

These stems have to stand severe usage, are subject to severe pressure strains and metal desired must be tough and even in texture. Can you advise a proper mixture from which to make the stems?

*Answer.* The first mixture you mention is a steam composition metal and is rather weak in castings. The other mixture is a good phosphor-bronze and you will find it strong and good. It is better for your purpose, but we advocate cutting down the phosphor tin to the following as it will give you better castings:

| | |
|---|---|
| Copper | 90% |
| Tin | 5% |
| Phosphor Tin | 5% |

Question No. 1383. Is black nickel now used for plating automobile lamps and parts such as the horn and windshield. We had the impression that it was, but have been informed that it was not employed for this work at the present time.

*Answer.* Black nickel is very little used for such work at the present time as it has been found insufficiently durable for articles of this nature. The most satisfactory material is a black lacquer or enamel and these are almost exclusively used for automobile work at the present time.

Question No. 1384. Does chilling increase the tensile strength of manganese bronze and if so is there any special way to cast it in the chill?

*Answer.* Chilling manganase-bronze castings always raises the tensile strength and raises the elastic-limit. The elongation and reduction of area are also increased. The physical properties, therefore, are greatly improved. The casting of manganese-bronze in a chill is limited to simple shapes, but it frequently happens that a chill can be set in a sand-mold and in a manner that a part of the casting can be chilled and considerably improved, but the whole casting will not be chilled. This method is often used for increasing the physical properties of a coupon test bar cast on a manganese-bronze casting.

Question No. 1385. Is there any method for preventing brass, screws, keys, etc., from tarnishing without lacquering?

*Answer.* There is no very satisfactory method except lacquering, although the articles may partially prevented by immersion in a hot solution of whale-oil soap and allowed to dry without further rinsing. The soap dries on the surface and protects the brass. Only the merest film is required for this. A soap solution containing a piece of whale-oil soap the size of a walnut in 10 gallons of water is all that is necessary.

Question No. 1386. We accumulate a lot of aluminum clippings from thin sheet and wish to know how we can melt it and cast into slabs for rolling into sheet again?

*Answer.* You can melt in an ordinary graphite crucible, cast into slabs or plates in an iron mold and obtain good looking castings, but they will not roll into sheet again. They will crack to pieces in rolling. No one has succeeded in rolling recast aluminum and the reason is that undoubtedly the oxide which forms during melting is so light that it does not clear itself from the aluminum, but remains in it causing it to crack.

Question No. 1388. What makes holes in brass castings? I find that they are good until machined and then holes and flakes show. What I am using is the following:

| | |
|---|---|
| Old Copper ............ | 25 lbs. |
| Old Brass .............. | 150 lbs. |
| 15% Phosphor-Copper ... | 15 lbs. |

I would like to know what the trouble is?

*Answer.* Your trouble is that you are using too much phosphor-copper. When there is any zinc present in the mixture the amount of phosphorus present must not be over 0.01 or 0.02 per cent., which is equivalent to one or two ounces to 100 lbs. of metal. You will appreciate that you are using a very large excess. The difficulty which a large excess of phosphorus causes is pin-holes in the casting the same as you have experienced. We suggest reducing the amount of phosphorus to 2 oz. per 100 lbs. of mixture, and be believe, if you are careful in melting not to overheat the brass and keep plenty of charcoal on it, you will have no trouble.

Question No. 1387. We have a quantity of iron brackets on hand to be finished in green. Could you inform me of a good formula that will be rust proof? I have tried many but they have failed.

*Answer.* The production of a green finish on iron by the corrosion process is not a very satisfactory job for the reason that the iron must be copper plated first and it is difficult to give a sufficiently uniform and heavy deposit on all parts to stand the corrosion. An acid copper must be used for the deposit, after flashing in cyanide copper, and as this does not "throw" well the result is a comparatively uneven coating. If the article is then corroded, the thin portions of the copper are cut through and a red instead of a green coating is produced. We recommend that you copper plate the iron in a cyanide solution, then oxidize in liver of sulphur and afterwards apply the green by means of pigment lacquer. Mix a little chrome-green with lacquer and apply with a brush. If stippled, the effect is better. Carbonate of copper may be used if a lighter shade is desired.

Question No. 1389. Is there a process for coating iron or steel with brass by dipping it in the molten metal? We have heard of this method and would like your opinion on the value and whether it can be applied to saddlery hardware?

*Answer.* There is a process of this kind and which has long been known. The brass is melted and covered with borax or boracic acid. The iron or steel, previously cleaned, is dipped into the brass and then withdrawn when it will be coated with it. The metal can be coated with copper in the same manner. The difficulty with the process is that the brass does not coat the surface of the article evenly and there is always the drip which shows. If an even coating such as that produced by tinning could be produced, it would be valuable, but the surface is not covered uniformly. On the top it is thin and on the bottom the drip is present so that it does not fullfill the requirements of a brass plated article. What is desired is a heavy, even coating.

Question No. 1390. How much potassium cyanide will it take to dissolve 1 lb. of carbonate of copper, so that there will be no free cyanide left?

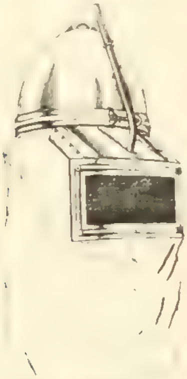
*Answer.* To dissolve 1 lb. of dry carbonate of copper 2.16 lbs. of potassium cyanide of 98-99 per cent. is required.

Question No. 1391. I have an order for zinc castings and have never had any experience in this line. Will you give me what information you can on the subject?

*Answer.* Zinc can be cast in sand easily and the only difficulty will be the cracking on account of shrinkage. The sand will have to be worked as dry as possible and not rammed too hard. The purer the zinc the less it is apt to crack. The common grades of spelter will frequently crack in the simple shapes. Large quantities of ornamental goods such as clock cases, lamp bases, etc., are made from zinc cast in metal molds and it has been found that only the purest grade of zinc can be used for the purpose. For this use, Bertha zinc is exclusively employed and if cheaper grades are used, the casting will invariably crack in cooling.

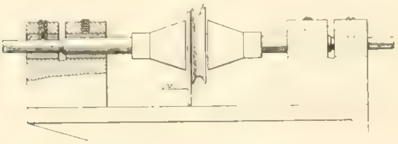
# Patent Abstracts.

1,075,906, Oct. 14, 1913. SANITARY SAND BLAST HELMET. William Duncan and John A. Spangler of Attica, Ind. A helmet to be worn by a workman operating a sand blast. The helmet is so designed that it will not interfere with the work and so that a proper supply of air can be obtained by the operator without causing a suction of the dust. The helmet is so constructed that it may readily be taken apart for cleaning.

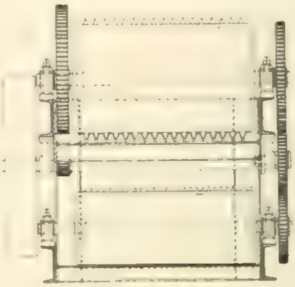


1,076,235 and 1,076,453, Oct. 21, 1913. CASE HARDENING MATERIAL and METHOD OF MAKING CASE HARDENING MATERIAL. Hugh Rodman of Edgewood, Pa. Assignor to the Rodman Chemical Company. The case hardening material is made of the following material: Coal, 100 parts; carbonate of soda, 10 parts; and lime, 15 parts. The whole is ground and passed through a 100 mesh sieve. Molasses water is then added and the whole baked to 1500° F., after which it is broken up as desired. The whole mass is then one of coke and free from dust, a strong objection to the ordinary form of case hardening material.

1,075,282, Oct. 7, 1913. ROTARY WIRE STRAIGHTENER. John J. Conlon of Derby, Conn. The wire straightener is so constructed that the wire is straightened by passing through an eccentric bushing revolved by a driving wheel operated by a belt.

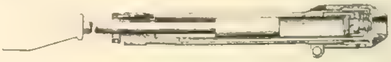


1,075,781, Oct. 14, 1913. APPARATUS FOR PREPARING TINNED SHEET IRON BOXES, ETC. Hans Goldschmidt of Essen-on-the-Ruhr, Germany. Assignor to the Goldschmidt Detinning Company of Jersey City, N. J. The invention relates to a method of preparing tin cans for the removal of the tin. The cans are flattened and perforated by means of rollers so that the detinning solution will have an opportunity to act readily.



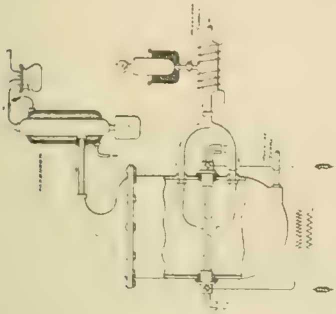
1,076,526. Oct. 21, 1913. WIRE COATING AND SPOOLING MACHINE. Myron D. Shiverick of Albany, N. Y. The invention relates to a machine for coating wire japan or baked varnish, particularly that to be used for electrical purposes. The wire is passed through the tank containing the japan, then through a wiper and next to the drying or baking oven where it is baked hard. It then passes to the spool where it is wound.

1,075,057, Oct. 7, 1913. PNEUMATIC SAND RAMMER. Samuel Oldham of Philadelphia, Pa. Assignor to Geo. Oldham & Son Company of the same place. The rammer is intended for use in ramming large sand molds. Any desired form of ramming head may be used on the rammer The construction is such that the rammer is easily controlled.



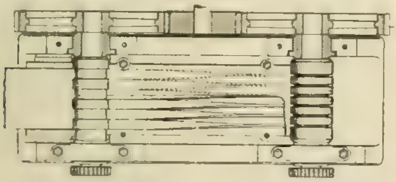
1,075,659, Oct. 14, 1913. SPINEL FIRE-BRICK, Charles Alfred Mankau of St. Petersburg, Russia. The use of from 3 to 6 per cent. of the mineral spinel in a fire brick is claimed. Spinel is a compound of the oxides of aluminum and manganese. The use in a dolomite or magnesite brick is claimed and it is stated that the spinel acts as a binder.

1,074,672, Oct. 7, 1913. METALLOIDAL MATERIAL. Ezechiel Weintraub of Lynn, Mass. Assignor to the General Electric Co. of Schenectady, N. Y. The patent is upon the production of elementary boron. The boron is reduced from boron chloride by means of hydrogen gas and in the apparatus shown in the accompanying sketch.



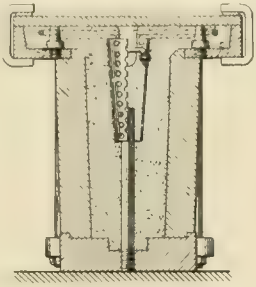
1,073,297, Sept. 16, 1913. WIRE WIPING MACHINE. Albert S. Smelser of Anderson, Ind. A machine for wiping the surface of a wire that has been galvanized or tinned. The mechanism is so constructed that it may be automatically raised and lowered for the passage of knots.

1,076,439, Oct. 21, 1913. APPARATUS FOR MANUFACTURE OF METALLIC BANDS. John B. McKibben of Crafton, Pa. The invention relates to the art of manufacture of a number of narrow strips or bands of sheet metal. The machine slits wide sheets into the required number of strips and automatically rounds the edges as they pass through the machine after slitting. The same effect as a flattened wire is thus produced.



1,075,135, Oct. 7, 1913. COMPOSITION OF MATTER FROM MAKING BRIQUETS OF FRAGMENTS OF METAL. Charles G. Alton of Hartwell, Ohio. The process is, the inventor states applicable to the briquetting of both the ferrous and non-ferrous metals. The metal is made into briquettes with a mixture of portland cement, lime and sand. The proportions are 95% of metal and 5% of the cement mixture.

1,075,290, Oct. 7, 1913. MOLD FOR HOLLOW ARTICLES. James W. L. Kerr and Charles V. Neeson, assignors to the Lawrenceville Bronze Company of Pittsburgh, Pa. The invention relates to a sand mold for casting bronze or copper twyers. The cope is formed of baked sand and the drag is formed with a matrix and seat for the cope in which it is supported. The metal can be fed to the matrix at or adjacent to the top and does not require long runners to the bottom. A considerable amount of metal otherwise wasted is thus saved and its remelting is obviated.



1,075,782, Oct. 14, 1913. METHOD OF RAISING THE ALLOYING QUALITY OF TITANIUM. Hans Goldschmidt and Otto Weil of Essen-on-the-Ruhr, Germany. Assignors to the firm of Th. Goldschmidt of the same place. The alloying of titanium with other metals is difficult on account of its high melting point. The claim of the patent is for alloying the titanium with a small amount of aluminum. It is stated that by this procedure the titanium can be made to alloy with other metals readily. The process is applied more particularly to steel.

1,075,289, Oct. 7, 1913. CORE BOX. James W. L. Kerr and Charles V. Neeson, assignors to the Lawrenceville Bronze Works of Pittsburgh, Pa. A core box for use particularly in casting bronze twyers. The box is made so that the venting of the core and seating it in the mold are more readily accomplished than in the ordinary case.

1,074,993, Oct. 7, 1913. METHOD OF RENDERING INSUFFICIENTLY DUCTILE METALS DUCTILE. Carl Trenzen of Cologne Braunsgeld, Germany. A method of rendering metallic tungsten ductile. The tungsten is heated to a high temperature and then, at the moment of cooling and the temperature at which it would pass to the crystalline condition, it is subjected to a considerable pressure.

# Trade Items.

A factory has been started by the Invisible Door Check Company at Niles, Mich. The first unit of this factory is to be 60 x 160 feet. The manufacture of a new invisible door check is to be carried on.

The United Novelty & Plating Company of West Medford, Mass., manufacturers of metal novelties, are to move to Malden, Mass. and have leased a building on Irving Place. It is stated that about fifty men will be employed.

The Bridgeport Deoxidized Bronze & Metal Company of Bridgeport, Conn. hae completed their new chemical laboratory and it is now in operation. The laboratory is in charge of C. S. Dunbar, the chemist and metallurgist of the company.

The capital stock of the-Standish Chain & Mfg. Co. of Kent, Ohio has been increased from $18,000 to $50,000 and the erection of a plant is to be carried out. A new automatic chain machine has been developed by the company and chain will be manufactured by this process.

The Westfield Plate Co. of Thompsonville, Conn., manufacturers of coffin hardware, are now manufacturing for the trade, a new form of lead hammer for machinists use. It is stated that it is not an ordinary common lead hammer but made of a special grade of lead and antimony.

The Interstate Automobile Company of Muncie, Ind., manufacturers of automobiles, have gone into the hands of a receiver. It is stated that the company owes $500,000 and that many of the accounts due the company are uncollectable, making them insolvent. The Judge has ordered the receiver to operate the company until all materials on hand are exhausted and orders filled.

The Roessler & Haaslacher Chemical Co., 100 Wiliam St., New York City, have just issued a new edition of their booklet entitled "Electroplating with Trisalyt" and which contains information regarding electroplating with copper, brass, bronze, zinc and silver Trisalyt. In addition the use of Gold Trisalyt is described and which has heretofore not been published. Salt-water methods with Gold Trisalyt is also given. The booklet will be sent free to all platers who desire it.

Extensive additions are being made to the factory of the Celluloid Zapon Company at Stamford, Conn. The building now used for lacquer mixing and storage is being duplicated so as to double the present capacity. The plant erected two years ago for making soluble cotton is being enlarged so as to give three times the present capacity. The construction is of brick and concrete in accordance with the most modern practice. The Stamford factory has been built nine years and it has been enlarged three times in order to take care of the constantly increasing business.

Fred C. Lawton, superintendent of the Gorham Mfg. Co. for the past 14 years, has resigned his position with the company. Mr. Lawton has been connected with the company for 30 years.

The Oil Furnace and Engineering Co., 60 Liberty St., New York City, manufacture a special furnace for melting Monel-metal. This furnace uses oil for fuel and is used by the largest founders of this interesting nickel alloy.

Joseph N. Smith & Company of Detroit, Mich., manufacturers of automobile hardware, have recently issued a new catalogue of the goods they manufacture. This comprises mouldings, locks, hinges, catches, and windshiel'd fixtures.

The Best Plating Company of Indianapolis, Ind. recently gold plated all the metal parts on a Waverly electric automobile made by the Waverly Company of Indianapolis, Ind. This car is to be shipped to Paris where it will be exhibited at the Grand Prix exhibition.

At the recent meeting of the stockholders of the Ajax Metal Company of Philadelphia, Pa., the following officers were elected: Chairman, J. G. Hendrickson; president and treasurer, J. R. Neison; First vice-president and secretary, G. H. Clamer; Second vice-president and general sales-manager, W. J. Coane.

The American Can Company has paid the Vulcan Detinning Company $671,000 which is owed to them as a result of the decision in the patent litigation on the process of detinning. The Vulcan company brought suit against this company some time ago alleging patent infringement and won the suit with the awarding, by the court, of this amount of damages. The American Can Company has now settled for this amount.

Two valuable books on the "Analyses of Coals in the United States" have recently been issued by the Bureau of Mines and which are very extensive treatises. They contain analyses and a description of the coal found in the United States and to those who use coal, the books will be found exceptionally valuable. They are called Bulletin No. 22 and are composed of two parts. Part one contains the analyses and contains 321 pages. Part two contains a description of the samples and contains 1200 pages.

The Goldschmidt Thermit Company, 90 West St., New York City, are placing on the market some new special alloys for use in connection with the brasses and bronzes. These alloys are free from carbon. Among those made are manganese-titanium containing 30-35 per cent titanium, and manganese-copper containing 30 per cent. of manganese Other alloys are chromium-copper, ferro-boron, ferro-vanadium, ferro-molybdenum, manganese-tin, manganese-zinc and pure chromium and manganese.

A plant for the manufacture of valves is to be established at Punta Gorda, Florida by the Lawrence Mfg. Co. of KeyWest, Fla.

The Southwestern Iron & Metal Company has been incorporated in Dallas, Texas with a capital stock of $6,000. The president is Philip Lipsitz of the Philip Lipsitz Co., manufacturers of car-bearings, brass ingot, solders and babbitt metals.

The theft of gold bullion from the works of Handy & Harmon of Bridgeport, Conn. by Albert B. Glynes, assayer for the company, was much smaller than reported and was confined to the pilfering of small laboratory samples of base-bars or similar material.

The Wood Manufacturing Company has been organized in Fairfield, Conn., and will manufacturing automobile lamps. The company is headed by Orlando E. Wood. A factory has been fitted up on Penfield Ave. in the building formerly occupied by the Brown Garage. A new type of lamp is to be manufactured.

A demonstration of Trisalyt for electroplating was recently made at the meeting of the Philadelphia branch of the American Electroplaters' Association on November 7th. Dr. Weber and Wm. Schneider of the Roessler & Haaslacher Chemical Co. represented the company and gave the demonstration. The demonstration took place at the works of the Hatrford Sterling Company in that city.

The Bristol Company of Waterbury, Conn., manufacturers of recording instruments, pyrometers and the Bristol sheet steel belt lacing, have taken over the business of the Goodwin Hollow Set Screw Company and have arranged for the exclusive manufacture of these valuable appliances. These set screws are the only ones which do not require a special wrench and are made with dovetailed slots so that an ordinary screw driver may be used.

Those who carry on soldering, and the majority of metal goods manufacturers do, should investigate the soldering sticks made by the L. B. Allen Co., Inc. 4548 Lincoln St., Chicago, Ill. This is a solder and flux combined in the right proportion and can be used on all metals except aluminum. This company also manufacture various kinds of fluxes, paste, salts and liquid for the trade, and the celebrated "Allen" flux as specified by the Government.

The Engineering Products Company, 44 Church St., New York City are placing on the market the celebrated "Demag" cold rolling machinery for brass and copper rolling mills, sterling silver manufacturers and all others who carry on cold rolling. The mills are made with motor drive when desired. They also make the machines used in the rolling mills that are accessories to the rolling mills themselves. The Engineering Products Company will send catalogue "R" upon request in which their products are described.

The plant and business of the Jones & Bixler Mfg. Co. of Freemansburg, Pa. has been sold at public auction. This concern manufactured iron toys and light castings and was one of the subsidaries of the Hardware & Woodenware Company.

The Mesta Machine Co. of Pittsburgh, Pa., have recently issued a new pamphlet on the "Mesta" gas engines for use with producer gas. The pamphlet describes the novel features of the engines and will be set to those interested.

The Bridgeport Testing Labrotary, 1119 Broad St., Bridgeport, Conn. chemists and metallurgists, have moved to 388 John St., where the building formerly occupied by the Newfield Silver Co. has been taken. Increased facilities for analytical and testing work are now had.

Users of celluloid, and there are now many in the metal manufacturing trades, are much gratified by the fact that, under the new tariff, its costs but 50 cents per lb. landed in the United States, while under the old tariff, the cost was $1.17. Alfred Burke, 693 Broadway, New York City imports all kinds of sheet for the trade.

F. W. Geswein Co., 16 John St., New York City, manufacturers of silversmiths, jewelers, platers and polishsers supplies and tools, have moved their factory from Brooklyn to 105 Chestnut St., Newark, N. J. Bristle and scratch brushes are manufactured by the company and an electroplating plant has been installed.

The Oakland Plating Works has been started by L. G. Delamothe and L. G. Delamothe Jr. at 1744 Telegraph Ave., Oakland, Cal. In addition to general job plating, refinishing and coloring, the plating of flowers, baby-shoes, wood, plaster and all non-metallic substances will be carried on. Mr. Delamothe is an expert in this line of work and the familiar gold plated roses formerly sold for hat pins were his invention.

The Bennett-O'Connell Co., 3600 South Morgan St., Chicago, Ill. the extensive manufacturers of plating and polishing supplies and equipment have recently placed on the market a new plating machine and which was exhibited at the Foundry & Machine Exhibition at Chicago, October 10-17th. This machine automatically takes the work to be plated at one end of the tank, passes it through cleaner, rinse and plating tank without any expenditure of labor.

W. T. Finkell, 100 William St., New York City is placing on the market a material which is called "Neutral Salts" and which are used in copper, brass, bronze and gold plating solutions in place of bi-sulphite of soda. These "Neutral Salts", when added to a cyanide plating solution will not affect the free cyanide, no matter how much are used. When bi-sulphite of soda is used, the free sulphurous acid in it neutralizes a portion of the free cyanide and thus disturbs the balance of the plating solution

Alsfield & Flynn have started an establishment at 31 Mathewson St., Providence, R. I. for carrying on electroplating, coloring and nickel plating. Fire-gilding is one of the specialties of the new firm.

The Cambridge Brass Co., Sudbury St. Boston, Mass., manufacturers of gas and electric fixtures, have taken a factory at Fulton and Valley Sts., Medford, Mass. sand and will move to this location.

The Champion Hardware Company of Geneva, Ohio, manufacturers of builders' hardware, are to start a gray iron foundry and have purchased a building for this purpose. Heretofore only a brass foundry has been operated.

The National Manufacturing Company of Waterbury, Conn., which was recently organized to make small sizes of brass, bronze and copper tubing, have awarded the contract for their new factory. It will be 70 x 100 feet

I. M. Jacobson & Sons of Detroit, Mich., metal merchants and alloy manufacturers, have weathered their recent financial difficulties and business has been resumed. They are now in a shape to take care of their business better than ever before. The offices of the company have been moved from the Ford Building to their smelting works at 70-72 Catherine St.

Joseph Landsman, 51 Maiden Lane, New York City, has consolidated his business with the Globe Art Metal Mfg. Co. and which has been moved to 71 Winthrop St., Newark, N. J. The manufacture of jewelry, silver deposit goods and hollow-ware will be carried on. Electroplating will be done. The new officers are President, F. D. Carey; vice-president and secretary, Joseph Landsman; and treasurer S. W. Weiss.

The Sprague Electric Works, 527-531 West 34th St., New York City, are sending out to the trade a Bulletin on "Industrial Ozonators" which are operated by the electric current. These ozonators are used for a variety of purposes, among which are ventilation and air purification. Ozone is generated by the current and which, it is now well established, is the greatest purifier of the atmosphere. The other uses are for bleaching, aging liquors, curing tobacco, sterlizing beer barrels and vats, and the hardening of paints, varnish, etc.

The Pope Mfg. Co. of Hartford, Conn., manufacturers of automobiles, motorcycles and bicycles have gone into the hands of a receiver and Col. Geo. Pope has been named by the Court for the position. This is the third time the company has become insolvent. It is stated that on account of the outstanding indebtedness the credit of the company has been greatly impaired and it has been difficult to do business. The apopintment of the receiver will now obviate this difficulty and it is believed that the company will be able to soon arrive at a good condition and pay everything in full.

The Vulcan Detinning Company of Sewaren, N. J., detinners of tin plate scrap, have declared a dividend of 21 per cent. on the preferred stock of the company.

The addition to the foundry of the Dow Wire & Iron Works of Louisville, Ky. has been started and will be used in connection with their metal bed department.

The Art Casting Works has been started in Newark, N. J. by F. G. Gagel and the casting of gold, silver and bronze will be carried on. The foundry is at 104 Verona Ave. A new process for casting in plaster of Paris has been developed by Mr. Gagel.

The new plant of the Carborundum Company, of Niagara Falls, N. Y., at Trafford Park, Manchester, England has been completed. This company now has works in England, France, Germany and the United States.

The Tallman Brass & Metal Co. of Hamilton, Ont. Canada, have purchased the plant and machinery of Lomas & Nelson, manufacturers of gas and electric fixtures, and will continue the manufacture of this class of goods in modern and artistic designs.

The Bridgeport Brass Company of Bridgeport, Conn. are building an extrusion machine for extruding brass shapes of various kinds. This machine is being built after their own design and it is expected that it will be ready for installation within a short time.

The new addition of the C. J. Root Company of Bristol, Conn. has been completed and is 40 x 120 feet, three stories high. This new building contains the polishing, plating and lacquering departments. The manufacture of hardware specialties, butts, hinges and revolution counters is carried on.

The Noiseless Typewriter Co. of Middletown, Conn. are now in the hands of a receiver. This concern started a few years ago to manufacture typewriters which are less noisy than the ordinary machine, but did not place many machines on the market although the machine was perfected. Lack of capital, it is stated, was the cause of the difficulty

The Apothecaries Hall Company of Waterbury, Conn. handle chemicals and plating supplies of all descriptions and are prepared to quote on the largest and smallest quantities. They are now making their own anodes and liquid potash and are prepared to make attractive prices on these goods. They solicit an opportunity to quote on 1914 requirements of manufacturing concerns and will gladly make such prices as may be desired.

Samuel B. Myers has sold his interest in the Gerline-Myers Brass Foundry Company of Kalamazoo, Mich. and has resigned his position as secretary and treasurer. Seymour H. Franklin has been elected to fill the vacancy. The officers of the company are now: President: Otto Gerline; secretary and treasurer, Seymour H. Franklin. The name of the company has been changed to the Gerline Brass Foundry Company.

The Western Automatic Machine Screw Co. of Elyria, Ohio, are considering the installation of an electroplating plant.

An addition is to be made to the plant of the Buffalo Copper & Brass Rolling Mill on Military Road, Buffalo, N. Y.

A factory has been secured by the Electric Toy Company of Baltimore, Md. on Ogden St., Newark, N. J. and the manufacture of electric toys wil be carried on.

The Peacock Mfg. Co., 46 Clifford St., Providence, R. I. have made an assignment for the benefit of their creditors. The manufacturers of jewelry novelties is carried on.

The Detroit Cyclecar Car Company has been organized in Detroit, Mich. with a capital stock of $250,000 and will manufacture cyclecars.

The McCue Company of Buffalo, N. Y. manufactures of automobile parts, wire wheels, etc., has been reorganized and the name changed to the Houk Mfg. Co.

A non-inflammable celluloid in sheets and tubes is being manufactured by the Societe Industrielle de Celluloid of France and is being imported into the United States by Alfred Burke of 693 Broadway, New York City. This material is called "Sicoid."

A factory has been started by Ernst Gideon Beck of Pforzheim, Germany, at 4 Oliver St., Newark, N. J. The manufacture of sterling silver mesh bags will be carried on and later it is expected that German-silver goods will be made.

The Jeffery-DeWitt Company of Detroit, Mich., manufacturers of spark plugs have reorganized their company under the laws of Maine with a capital stock of $500,000 An addition to the plant will be made and which will be 50 x 200 feet.

The factory of the New York Buff Co. at 210 Canal St., New York City was recently badly damaged by fire which occurred in the building above them. The damage was mostly by water. They have taken new quarters at 215 Canal St. and business is being carried on as usual.

The Hanson & Van Winkle Co. of Newark, N. J., are placing on the market a new abrasive material called "Electrite Emery" and which will perform a far greater amount of work than ordinary emery. The gain is 40 per cent. and 1 lb. of "Electrite" emery will do as much as 1.4 lbs. of ordinary emery. The quantity of glue required to hold it is also reduced.

The "Carboy Inclinator" manufactured by The Carboy Inclinator Company, 1269 Broadway, New York City is a new device for holding acid carboys while the contents are being poured out. The pouring of the contents in the ordinary manner is not only an unsatisfactory and laborious operation, but also dangerous. By means of the inclinator the last drop may be poured without the slightest danger and with very little exertion.

The capital stock of the Continuous Zinc Furnace Co. of Hartford, Conn. has been increased from $25,000 to $1,000,000.

A site has been purchased by the Northern Plating Works of Chicago, Ill. at Ogden and Campbell Aves. and a new factory will be erected upon it.

The Chicago Steel Tape Company, recently organized in La Crosse, Wis. with a capital stock of $10,000, are to manufacture surveyors and engineering instruments.

The firm of Almy & O'Brien have been organized in Providence, R. I. for carrying on gold and silver refining and sweep smelting. The works are located at 44 Borden St.

The factory of the Premo Mfg. Co. has been moved to 60 Shipman St., Newark, N. J. The manufacture of sterling-silver, German-silver and bronze vanity and cigarette cases is now carried on.

It is expected that the New England Watch of Waterbury, Conn., which recently went into the hands of a receiver, will be reorganized after January 1st. The concern employs about 250 hands.

The La France Fire Engine Company of Elmira, N. Y. manufacturers of fire engines, are preparing plans for an addition to their plant. This addition is to be 120 x 130 feet and principally two stories high.

A new three-story brass foundry building is to be erected by the Lamson Consolidated Cash Carier Co. of Lowell, Mass., manufacturers of cash and bundle carriers. The cost of the new building wil be $60,000.

The assets of the Piper Mfg. Co. of West Somerville, Mass. has been sold at public auction. The firm succeeded the Johnson, Hayward & Piper Co. of the same place and the manufacture of jewelry novelties was carried on.

## Personal.

J. H. Hansjosten of Chicago, Ill. has taken charge of the plating and polishing departments of the Globe Stove & Range Company of Kokomo, Ind.

George Veillard, formerly with the Roman Bronze Co. of Brooklyn, N. Y., has taken the position as manager for the Joseph Reinbold & Co. of Newark, N. J., manufacturers of fine castings in gold, silver and bronze.

Victor C. Lassen, formerly superintendent of the Vanadium Metals Co. of Groton, Conn. and founder of the former Victor Metals Company of East Braintree, Mass. which was absorbed by the Vanadium Metals Co., is now in St. Petersburg, Russia where is is engaged in starting a brass foundry for the Russian Government. This Government is to spend a large amount of money in the construction of new battle ships and have heretofore purchased their brass and bronze castings from other countries, and will, after the completion of their new foundry, make their own.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure 98-99% | lb. | [illegible] |
| Acid, Acetic, pure 30% | lb. | [illegible] |
| Acid, Arsenious (White Arsenic) | lb. | .10 |
| Acid, Benzoic | lb. | [illegible] |
| Acid, Boracic (Boric), pure | lb. | .12 |
| Acid, Hydrochloric, see Acid, Muriatic | | |
| Acid, Hydrofluoric, 30% | lb. | .04 |
| Acid, Hydrofluoric, 50% | lb. | .10 |
| Acid, Muriatic, 20° | lb. | [illegible] |
| Acid, Muriatic, c. p., 20° | lb. | [illegible] |
| Acid, Nitric, 38° | lb. | [illegible] |
| Acid, Nitric, 40° | lb. | [illegible] |
| Acid, Nitric, 42° | lb. | .06¼ |
| Acid, Nitric, c. p. | lb. | .08 |
| Acid, Sulphuric, 66° | lb. | .01¾ |
| Acid, Sulphuric, c. p. | lb. | .06 |
| Alcohol, Wood | gal. | [illegible] |
| Alcohol, Denatured | gal. | [illegible] |
| Alum | lb. | .04 |
| Aluminum, Metallic, in Ingot | lb. | .21 |
| Ammonium Sulphate | lb. | [illegible] |
| Aqua Fortis, see Acid, Nitric | | |
| Ammonia Water (Aqua Ammonia), 20° | lb. | [illegible] |
| Ammonia Water (Aqua Ammonia), 26° | lb. | .06¼ |
| Ammonia Water, c. p. | lb. | .08 |
| Ammonium Carbonate, lump | lb. | [illegible] |
| Ammonium Chloride (Sal Ammoniac) | lb. | [illegible] |
| Ammonium Hydrosulphuret | lb. | [illegible] |
| Ammonium Sulphate | lb. | [illegible] |
| Ammonium Sulphocyanate | lb. | [illegible] |
| Amyl Acetate | gal. | [illegible] |
| Antimony | lb. | [illegible] |
| Arsenic, Metallic | lb. | .10 |
| Arsenic, White (Acid Arsenious) | lb. | .10 |
| Argols, White (Cream of Tartar) | lb. | [illegible] |
| Asphaltum, Commercial | lb. | [illegible] |
| Asphaltum, Egyptian (Bitumen) | lb. | [illegible] |
| Benzine | gal. | [illegible] |
| Benzol, Pure | gal. | [illegible] |
| Bismuth, Metallic | lb. | [illegible] |
| **Bitumen, see Asphaltum.** | | |
| Blue Vitriol, see Copper Sulphate | | |
| Borax, Crystals or Powdered | lb. | [illegible] |
| Borax Glass | lb. | [illegible] |
| Cadmium, Metallic | lb. | [illegible] |
| Carbon Bisulphide | lb. | .10 |
| Calcium Carbonate (Precipitated Chalk) | lb. | .10 |
| Chrome Green | lb. | [illegible] |
| Copper, Lake (Carload) | lb. | [illegible] |
| Copper, Lake (Case) | lb. | [illegible] |
| Copper, Electrolytic (Case) | lb. | [illegible] |
| Copper, Electrolytic (Carload) | lb. | [illegible] |
| Copper, Casting (Carload) | lb. | [illegible] |
| Copper, Casting (Case) | lb. | .16¼ |
| Copper Acetate (Verdigris) | lb. | [illegible] |
| Copper, Carbonate, dry | lb. | [illegible] |
| Copper Sulphate (Blue Stone) | lb. | .06 |
| Corrosive Sublimate, see Mercury Bichloride | | |
| **Cream-Tartar, see Potassium Bitartarate** | | |
| Cryolite | lb. | [illegible] |
| Cyanide, see Potassium Cyanide | | |
| Dextrin | lb. | [illegible] |
| Emery Flour | lb. | .04 |
| Emery, F F & F F F | lb. | [illegible] |
| Flint, powdered | lb. | .01 |
| Fluor Spar | lb. | .01¼ |
| Fusel Oil | gal. | [illegible] |
| Gold Chloride | oz. | [illegible] |
| Gold, Pure | oz. | [illegible] |
| Gum, Copal | lb. | [illegible] |
| Gum Guaiacum | lb. | [illegible] |
| Gum Mastic | lb. | [illegible] |
| Gum Sandarac | lb. | [illegible] |
| Gum Shellac, brown | lb. | [illegible] |
| Gum Shellac, white | lb. | .60 |
| Iridium | oz. | [illegible] |
| Iron Perchloride | lb. | [illegible] |
| Iron Sulphate (Copperas) | lb. | [illegible] |
| Lead Acetate (Sugar of Lead) | lb. | [illegible] |
| Lead, Pig | lb. | [illegible] |
| Lead, Red | lb. | .12 |
| Lead, Yellow Oxide (Litharge) | lb. | .12 |
| **Liver of Sulphur, see Potassium Sulphide** | | |
| Manganese, Ferro, 80% | lb. | .10 |
| Manganese, Metallic, pure | lb. | .75 |
| Magnesium, Metallic | lb. | 1.50 |
| Mercury Bichloride (Corrosive Sublimate) | lb. | 1.12 |
| Mercury, Metallic (Quicksilver) | lb. | .38 |
| Mercury Nitrate | lb. | 1.50 |
| Mercury Oxide, yellow | lb. | 1.80 |
| Nickel and Ammonium Sulphate (Double Salts) | lb. | .08½ |
| Nickel Carbonate, dry | lb. | .60 |
| Nickel Chloride | lb. | .50 |
| Nickel Metallic | lb. | .45 |
| Nickel Sulphate (Single Salts) | lb. | .20 |
| Nitre (Saltpetre), see Potassium Nitrate | | |
| Oil of Vitriol, see Acid, Sulphuric | | |
| Paraffine | lb. | .15 |
| Phosphorus, yellow | lb. | .40 |
| Phosphorus, red | lb. | 1.10 |
| Pitch | lb. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Chloride | oz. | 46.00 |
| Platinum Metallic | oz. | 45.00 |
| Potash by Alcohol, in sticks | lb. | .45 |
| Potash, Caustic | lb. | .06 |
| Potassium Bichromate | lb. | .14 |
| Potassium Bitartarate (Cream of Tartar) | lb. | .31 |
| Potassium Carbonate (Pearlash) | lb. | .10 |
| Potassium Chlorate | lb. | .15 |
| Potassium Cyanide | lb. | .25 |
| Potassium Iodide | lb. | 3.15 |
| Potassium Nitrate (Nitre or Saltpetre) | lb. | .10 |
| Potassium Permanganate | lb. | .17 |
| Potassium, Red Prussiate | lb. | .55 |
| Potassium, Yellow Prussiate | lb. | .35 |
| Potassium Sulphide (Liver of Sulphur) | lb. | .15 |
| Potassium Sulphuret, see Potassium Sulphide | | |
| Potassium Sulphocyanate | lb. | .70 |
| Pumice, Ground | lb. | .05 |
| Quartz, Powdered | lb. | .01 |
| Rosin, Yellow | lb. | .08 |
| Sal Ammoniac, see Ammonium Chloride. | | |
| Sal Soda, see Sodium Carbonate | | |
| Silver Chloride, dry | oz. | .75 |
| Silver Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | .59⅛ |
| Silver Nitrate, crystals | oz. | .50 |
| Soda Ash | lb. | .05 |
| Sodium Biborate, see Borax | | |
| Sodium Bisulphite | lb. | .15 |
| **Sodium Carbonate (Sal-Soda), crystals** | lb. | .02 |
| Sodium Hydrate (Caustic Soda) | lb. | .05 |
| Sodium Hydrate (Caustic Soda) by Alcohol (in sticks) | lb. | .45 |
| Sodium Hyposulphite ("Hypo") | lb. | .04 |
| Sodium Metallic | lb. | .90 |
| Sodium Nitrate | lb. | .05 |
| Sodium Phosphate | lb. | [illegible] |
| Sodium Silicate (Water Glass) | lb. | .04 |
| Soot, Calcined | lb. | .15 |
| Spelter, see Zinc | | |
| Sugar of Lead, see Lead Acetate | | |
| Sulphur (Brimstone), in Lump | lb. | .05 |
| **Tin Chloride** | lb. | [illegible] |
| Tin, Metallic | lb. | [illegible] |
| Turpentine, Venice | lb. | .35 |
| Verdigris, see Copper Acetate | | |
| Water, Distilled | gal. | .15 |
| Water Glass, see Sodium Silicate | | |
| Wax, Beeswax, yellow | lb. | .45 |
| Wax, Carnauba | lb. | [illegible] |
| Whiting (Ground Chalk) | lb. | .02 |
| Zinc, Carbonate, dry | lb. | .12 |
| Zinc, Chloride | lb. | .12 |
| Zinc, Sulphate | lb. | .06 |
| Zinc (Spelter) | lb. | [illegible] |

# THE BRASS WORLD AND PLATERS' GUIDE

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## External Light as a Factor in Pouring Metal.

In casting metal into molds, either those of sand or metal, it has always been customary to judge the heat by the eye. Although the pyrometer is used to a certain extent (not as extensively as it should be) the great majority of metal is poured by the eye and this method has resulted, is resulting and will continue to result in more or less defective work. While the eye is quite accurate, when one becomes accustomed to use it under uniform conditions, it is also treacherous when these conditions are changed.

In the use of the eye for the determination of the temperature of molten metal, there are two very necessary conditions which must be obtained:

1. The eye must be trained so that the color of the metal can be judged accurately.

2. The light falling upon the metal should be invariably uniform.

The training of the eye so that the color of the metal may be readily judged is a matter that can be obtained only by experience and this is why an untrained workman never does as well as one who is experienced. It is not surprising that this should be true as the pouring of metals, like other mechanical operations, is an art and experience alone can produce perfection in it.

The second consideration, or that of the light falling upon the metal while the pouring is taking place, is equally as important as judging of the heat of the metal, but one that has not been fully appreciated. It is very important and one which may cause a poor casting.

The temperature of molten metal, as judged by the eye, depends upon the light falling upon the metal itself and if care is not used to have the light always the same, an error in the pouring temperature will be made. Take, for example, a stream of molten brass which is being poured into a mold. One judges the heat by the color and this idea of color is obtained under certain conditions of external light, usually those of an ordinary day when the sun is shining. Now if the metal be poured in the dark, then it will appear very much hotter than in the day time and the right pouring temperature will not be obtained. On the other hand, direct sunlight falling upon the stream of molten metal will cause it to appear at a lower heat than in difused light and a similar error will result.

In pouring metal, therefore, either into sand or iron mold, uniform light should be had and pouring in direct sunlight or in the dark is dangerous and gives erroneous results as far as judging temperature by the eye is concerned. There is always a certain pouring temperature for every casting and the results are always obtained when this temperature is maintained from day to day.

## The Success of Sodium Cyanide in Electroplating.

It was in December 1910 that the use of sodium cyanide in electroplating was first brought to the attention of the trade through the columns of The Brass World. It is believed that this was the first time mention had ever been made of the subject. While it is true that sodium cyanide had been used for a considerable length of time in the cyanide process of treating gold ores, it had never been employed in electroplating up to this time, at least as far as known.

In a short time after the previously mentioned article appeared, platers began to use sodium cyanide in an experimental way and, like many other new materials, it was condemned by many. Not all persons are capable of experimenting and this was the case with some of the platers who tried out sodium cyanide and the result was that a diversity of opinions followed. Some platers stated that it gave equally as good results as potassium cyanide or the double potassium and sodium cyanides, while others maintained that good results could not be obtained with it. These opinions, when one stops to consider the mystery that has always surrounded electroplating, particularly in the case of cyanide plating solutions, are not surprising.

To-day all is changed and it is difficult to find a plater who is averse to sodium cyanide. Those who were so antagonistic to it were persons who did not know how to try it out in the right manner and so condemned it wrongly, while platers who did try it out in a scientific and painstaking manner arrived at the conclusion that it is the equal of the straight potassium cyanide or the double potassium and sodium cyanides.

Much of the early difficulty with sodium cyanide was caused by the fact that it is much stronger than the other cyanides. By this is meant it has greater dissolving power for carbonate of copper or silver salts, and if used in the same proportions as potassium cyanide or the double cyanide, there will result too much free cyanide in the plating solution. This fact has explained why sodium cyanide has not given good results in some instances.

Sodium cyanide has now stood the test of time and is being employed by not only the largest manufacturer of silver plated ware in the country, but also some of the most extensive manufacturers who carry on copper and brass plating. So far there have been no dissenting voices, as far as those who are capable of judging are concerned.

The advantage of sodium cyanide lies in the fact that, owing to its greater dissolving power, it is cheaper than other cyanides; and in addition, its purity and effectiveness in overcoming "spotting-out."

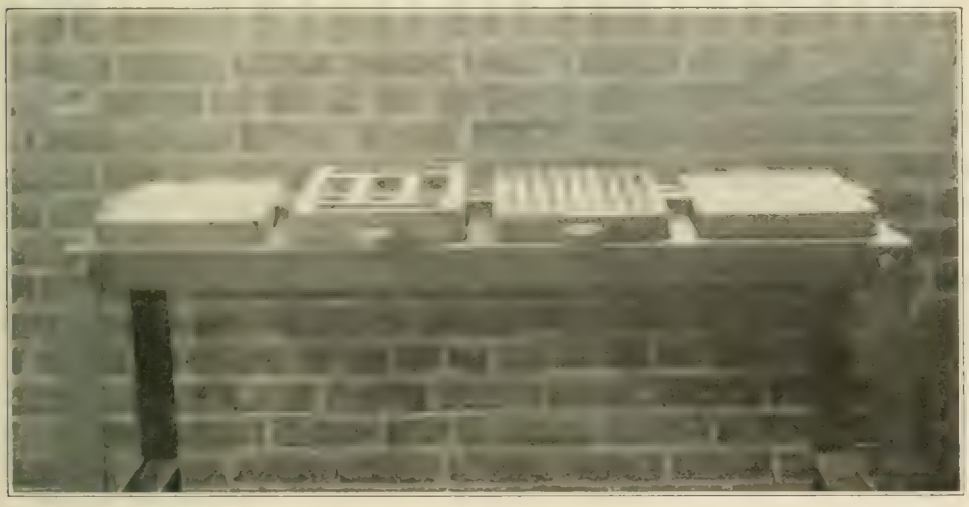
Up to the present time of writing it can safely to be said that sodium cyanide is a success in the plating trade.

Two similar metals do not make good bearing surfaces and this explains why bronze or other alloys is used with steel shafts.

Although at one time metallic iridium was less expensive than platinum, it is now worth nearly double. Formerly there was no use for it except for the points of gold pens, but now it is used as a hardener for platinum. Very little pure platinum is now used and nearly all commercial metal is the so-called "hard" platinum which is an alloy of platinum and iridium.

# Convenient Tilting Solder and Babbitt Molds.

In casting solder ,babbitt or other soft metals, it is customary to use cast-iron molds as this metal gives the best service and is also cheap. To obtain a smooth surface on a solder or babbitt bar, the surface of the mold must be smooth and those who desire to produce such a smooth bar will have to plane the inside of the mold. The procedure, of course, causes considerable expense, but those who make these materials for the market usually consider it pays on account of the improved appearance of the bar. Soft metals always take every impression on the surface of the mold and, naturally, a rough surface will give a rough solder or babbitt bar.



The Tilting Molds for Solder and Babbitt Metal, Showing Frame for Holding Them.

Many makers of solder or babbitt do not consider it necessary to go to the expense of planing the molds and obtain iron mold castings with as good a surface on them as possible and let the matter go at that. This method is good, and if a good mold casting is obtained, then the solder or babbit bars are quite good and will have a satisfactory appearance. They will be slightly rough, but will have a uniform appearance and much of the commercial solder or babbitt-metal sold is made from such molds.

In obtaining molds which are not to be planed, good patterns which draw out of the sand readily should be made for the reason that if they do not come out easily and the mold requires patching, then the surface will be bad and nothing short of planing will overcome the trouble. A good molding job is required and the smoother the castings, of course, the better the solder or babbitt bars made in them. When cast, the cast iron molds will be slightly rough (and frequently considerably so) on acount of the sand that is burned on the surface, and this will have to be removed, otherwise the castings made in them will not be good.

There are two ways of removing the sand from the mold castings. First, by a sandblast. Second, by pickling in hydrofluoric acid. Frequently both are used. In either event, the surface of the mold should be left clean and uniform and then a good bar can be produced in it. Cast-iron molds last for many years and the surface will gradually become better and better as they are used.

Cast-iron molds should be made of a good thickness so that they will withstand hammering to remove the cast bars without cracking or distortion, and also to hold the heat for the necessary length of time. A cold mold does not give a good casting nor does one too hot, and there is a certain temperature at which the best bar can be obtained. If, therefore, the mold is not sufficiently heavy, it will cool too rapidly after once arriving at the right heat. It is necessary, of course, to cool molds with water if they are constantly used but the experienced workman will know just how frequently to cool them to maintain them at the uniform temperature at which the best bars are obtained.

Ordinary solder or babbitt molds have been cast with a handle attached to the end for dumping them when the bars have set, and by turning them up side down, the bars would usually fall out. If one should happen to stick in the mold, then by hammering the bottom, it could be detached. In the case of rough molds, it would frequently happen that the bars would adhere to the molds quite tenaciously and considerable hammering would be required to detach them. With good mold castings this procedure should not be required and the cast bars should fall out of their own accord when the mold is tilted, or if not by a slight tap of a hammer on the bottom of the mold.

These handled molds have never been quite satisfactory for the reason that they are difficult to manipulate. The handle is hot and must be held with tongs or a rag so that the hands will not become burned. This means an obstacle in the way of successful manipulation. Then, too, if the castings do not drop out of the mold readily, additional labor is required to hammer them out on account of being obliged to hold the mold in one hand.

A good, serviceable solder, babbitt or other soft metal mold may readily be made after the method shown in the ilustration accompanying this article. These molds are made so that they will tilt and the cast bars can readily be dumped from them after they have been cast and have set. The molds are made in the same manner as any solder or babbitt mold and of cast-iron. They may, however, be made considerably larger, if desired so that a greater number of bars can be cast, for the reason that the molds do not require lifting at all by hand. It is unwise, however, to use too large a mold and those shown in the illustration are excellent. From 6 to 8 solder bars in a mold is good practice.

The molds are cast with trunnions on the middle so that they nearly balance. This procedure requires no machine work at all and the simple casting, as it comes from the mold will suffice provided, of course, that the pattern has been made so that the trunnions are situated in the right place. The idea is to have them slightly off the middle and thus cause the mold to over balance itself. This allows tilting readily and, at the same time, it rests in the normal condition solidly. At the end of the mold a lug is cast so that it not only acts as a stop when the mold is tilted in either direction, but also is used for a handle by which it can be lifted.

The molds are held in a cast iron frame containing holes in which the molds fit and on the side grooves are made in which trunnions fit and revolve. This frame is held in place by legs made of angle iron. The whole forms an excellent and durable appliance. The top may be made as long as desired so as to hold as many molds as may be necessary. It is not imperative that iron shall be used for the legs or frame and a quite serviceable one can be produced from wood. Sufficient space should be allowed, however, between the mold and the frame so that the heat of the mold will not burn the wood. A quarter of an inch is all that is required all around and the trunnions should be supplied with iron rests so that they, too, will not burn the wood.

The solder or babbitt metal is cast into the mold in the usual way, by means of a ladle and when the bars have set, the mold is tilted over and the lug on the mold allowed to strike on the opposite side of the frame. This procedure will usually result in all the cast bars falling out, but if they do not, then a slight tap with a hammer on the bottom will cause them to drop.

The fact that the mold is out of balance, on account of the lugs having been placed away from the middle, will cause it to tilt back easily in its normal position for pouring and remain in this condition solidly for the next pouring.

## An Aluminum Solder Containing Bismuth.

A new aluminum solder containing bismuth has been patented by Charles Willmott of Smethwick, England. It consists of the following ingredients:

| | |
|---|---|
| Tin | 86% |
| Bismuth | 14% |

It is stated that the solder is used without a flux and a blowpipe is employed as the source of heat. When melted on the surface of the aluminum, a scraper is used to make the solder adhere to it.

## The Electrodeposition of Palladium.

Palladium is a white, malleable metal which belongs to the so-called platinum group of metals. In color it is considerably whiter than platinum, but not quite as white as silver. It is whiter than nickel. It does not tarnish in the air, for sulphur and other gases, which affect silver, have no action upon it.

Palladium is a rare metal and is found associated with platinum in its ores. More or less is also found in the residues obtained in the electrolytic refining of copper, silver and gold. Palladium rolls into sheet easily and draws into wire and, therefore, is a malleable and ductile metal. Its specific gravity is 12 so it is very close to that of silver which is 10.53. It is much lighter than platinum as the specific gravity of this metal is 21.5 while that of gold is 19.3 Palladium melts at 2820° F. while platinum has a melting point of 3191° F. and that of gold is 1945° F. As nickel melts at 2646° F. it will be seen that of palladium is a trifle higher.

The fact that palladium has a white color and does not tarnish in the air has caused it to be used for electrodeposits although not extensively. Its chief use in this direction has been in the plating of watch movements and for scales of astronomical and similar instruments upon which a white coating is desired that will not tarnish like silver. As palladium has nearly as white color as silver but does not tarnish in the air any more than platinum, and in addition it is harder than silver and wears better, its use for such purposes is admirable.

In the United States, there seems to be no one who is using palladium for electroplating, although in Switzerland and France it is supposed to be used for plating watch movements more or less extensively. Movements are imported from these countries that have the appearance of having been plated with palladium, but so far an opportunity has not arrived for testing them. They are the expensive movements. Nickel is used for the same purpose and this gives a white color, comparatively non-tarnishable, but as nickel is much harder than palladium, it is more apt to flake or chip off while in use, particularly if not deposited in a very soft condition. Comparatively speaking, palladium, therefore, is preferable to nickel for plating watch movements.

While there are various solutions that can be employed for the electrodeposition of palladium and the simple chloride is one of them, the best plating bath is one patented by Gaston Pilet and Clement Carry of Besancon, France in 1885. This patent has now expired, of course, and anyone is free to use it. The solution is composed of the chloride of palladium, phosphate of ammonia and phosphate of soda with a little benzoic acid which, the inventors say, causes the palladium deposit to become whiter. The method of making it is as follows:

Watch Movements Plated with Palladium.

Take 5 pennyweights of palladium (¼ oz.) in the form of thin sheet and cut up into small bits. Palladium usually occurs in commerce in the form of thin sheet and is easily cut. When in this condition it will dissolve more rapidly.

Place the palladium in a small glass flask and add to it

| | |
|---|---|
| Strong Muriatic Acid ........ | 1¼ oz. |
| Strong Nitric Acid ........... | 1 oz. |

Heat the flask gently until the palladium dissolves and then add the solution to a porcelain evaporating dish (rinse the flask out with distilled or rinse water) and evaporate on a sand bath until the excess of acid has been driven off and a brown-black residue has been obtained. Do not carry this evaporation too far but just when the residue is solid and more or less pasty. If carried to absolute dryness a basic salt will form which will not dissolve readily.

Now add to this residue of palladium chloride ½ oz. of distilled or rain water to dissolve it. The solution should be dark brown and practically clear. If it does not dissolve, add a little more water and warm, but it will usually go into solution readily and there is obtained a strong, neutral solution of chloride of palladium.

Now make a solution of

| | |
|---|---|
| Water | [illegible] |
| Ammonium Phosphate | [illegible] |

This solution is warmed and *is added to previously obtained solution of chloride of palladium.* The liquid thus obtained will have a yellowish and turbid appearance. Now add to this solution one made of the following:

| | |
|---|---|
| Phosphate of Soda .......... | 8 [illegible] |
| Water .... | 2 quarts |

The solution thus obtained is now boiled for a short time until all odor of ammonia has disappeared and the solution itself has become clear. To it is now added

| | |
|---|---|
| Benzoic Acid | [illegible] |

This substance gives a whiter and better palladium deposit, although it may be dispensed with if desired.

To the solution thus obtained add

| | |
|---|---|
| Water | 1 quart |

The solution is now ready for plating and will approximate 1 gallon in volume. While the solution may be used cold, it is preferable to warm it to about 120° F. when employed for plating. The palladium may be deposited on brass, copper, steel or iron and from 5 to 10 minutes duration will suffice for a good thickness. Either a platinum anode or one of carbon will have to be employed and nothing is given off from it on account of the fact that the solution does not attack it. For the carbon, that from an old dry battery can be used, but before using it should be soaked for some time in hot water to remove the sal-ammoniac in it. Platinum is the best, of course, for the anode although quite expensive. The solution should be used in a porcelain dish, glass, or enameled vessel.

A feeble current only is required for the electrodeposition of the palladium and from 1 to 2 volts will suffice.

## A Good Brass Solution for Barrel Plating.

For barrel plating a plating solution has the same ingredients in it as for basket or steel plating, but it should be stronger in order to possess the requisite conductivity for allowing the passage of the current. The resistance presented to the passage of the current in barrel plating is far more than in basket or steel plating, and for this reason, the solution should be stronger in order to offset this feature and furnish as little resistance to the passage of the current as possible.

The following brass solution is in use by one of the most expert platers on barrel work in the United States and has always given the best of satisfaction. It is particularly suited for brass plating steel goods and gives a normal or yellow brass identical with good sheet brass. The formula is as follows:

| | |
|---|---|
| Water | 100 gallons |
| Potassium Cyanide | 80 lbs. |
| Copper Carbonate | 60 lbs. |
| Zinc Carbonate | 40 lbs. |
| Sodium Carbonate | 60 lbs. |
| Ammonium Carbonate | 15 lbs. |
| Sodium Bi Sulphite | 12 lbs. |

The cyanide is dissolved in the water and then the carbonates of copper and zinc are dissolved in it. The sodium carbonate (sal soda) is next added and then the ammonium carbonate and sodium bisulphite. The whole is then thoroughly stirred.

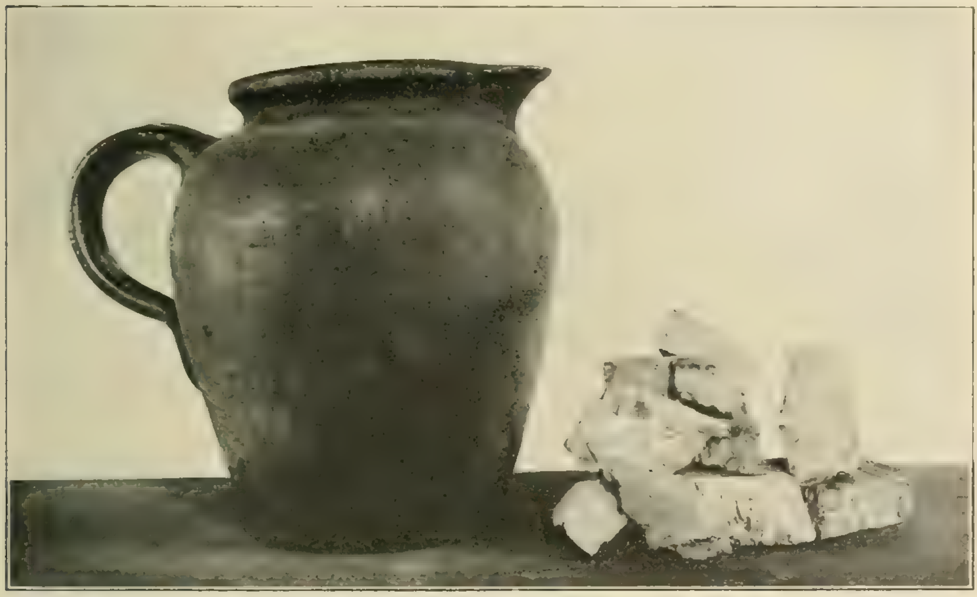
The brass solution can be run cold, but always gives better results if warm, particularly in winter. The plater can suit himself on this point, but it should be borne in mind that the solution should not be used hot but only warm. Many platers believe that cyanide solutions should be run quite hot. This is a mistake as the cyanide quickly decomposes under such conditions, the ammonia is driven off, and water evaporated rapidly. The results obtained in such hot solutions are not enough better to warrant the toleration of the difficulties encountered. A good temperature for a brass solution is about 120° F. In running a plating barrel, the solution will warm up after a time, as the resistance of the solution generates heat. It is unwise, however, to use a brass plating solution below 70° F.

# Some Notes on the Hot Tinning of Iron and Steel.

Continued from Page 387.

While some grades of tin are a little better than others, there is such a slight difference in the purity that it would seem to make little difference which is used, and practice seems to bear this belief out. It would seem, therefore, that for tinning, one brand of tin is practically equal to the others.

Of all the grades of tin, those known as the "Straits" brands have the best reputation and always command a little higher price than other grades. Such tin comes from the Straits Settlements in the East Indies and there are a number of well known brands in the class. The brand which is the leader and which is called the purest tin known is named "Banca Tin" and to-day it is called the best tin found and always commands the highest price. Nothing purer can be purchased at any price. Although some of the other Straits brands may run a trifle purer now and then, the "Banca" is called the leader and the best tin sold on the market. It is so pure that it is customary for manufacturers or dealers in fine chemicals to simply melt it and recast into small bars to be sold as a chemically pure product.



Muriatic Acid and Spelter for Making the Chloride of Zinc Flux.

Analyses of some of the leading brands of tin are as follows:

*Banca Tin (Straits)*

| | |
|---|---|
| Tin | 99.950% |
| Antimony | 0.007% |
| Arsenic | none |
| Lead | trace |
| Bismuth | none |
| Copper | 0.018% |
| Silver | none |
| Sulphur | none |

Other brands of Straits tin are as follows:

*Billiton (Straits)*

| | |
|---|---|
| Tin | 99.960% |
| Antimony | 0.006% |
| Arsenic | none |
| Lead | none |
| Bismuth | none |
| Copper | 0.023% |
| Iron | none |
| Silver | none |
| Sulphur | none |

*Penang (Straits)*

| | |
|---|---|
| Tin | 99.939% |
| Antimony | trace |
| Arsenic | 0.013% |
| Lead | trace |

| | |
|---|---|
| Bismuth | none |
| Copper | 0.016% |
| Iron | 0.028% |
| Silver | none |
| Sulphur | 0.004% |

It will be appreciated, therefore, that the leading brands of Straits tin, as shown by the preceding analyses, are extremely pure and really equal, if not surpass, any other commercial metal in purity.

Some other brands of tin are the Chinese, which is produced from Chinese ores and the so-called Theo. Goldschmidt brand which is the result of detinning tin-plate scrap. It will be noticed that there is a wide variation in the Chinese brands.

The analyses of the Chinese brands are as follows:

*Chinese No. 1.*

| | |
|---|---|
| Tin | 99.343% |
| Antimony | 0.031% |
| Arsenic | 0.040% |
| Lead | 0.434% |
| Bismuth | 0.007% |
| Copper | 0.052% |
| Iron | 0.010% |
| Silver | none |
| Sulphur | 0.011% |

*Wing Hong & Co. No. 3 (Chinese)*

| | |
|---|---|
| Tin | 95.280% |
| Antimony | 0.381% |
| Arsenic | 0.050% |
| Lead | 3.995% |
| Bismuth | 0.020% |
| Copper | 0.106% |
| Iron | 0.026% |
| Silver | 0.018% |
| Sulphur | 0.008% |

It will be seen that the No. 3 grade of Chinese tin is quite impure and should not be used for tinning. The amount of lead is such that it will not give as bright coating as a better grade of tin. Lead, of course, tends to give a dull and easily tarnished coating of tin. The No. 1 grade of Chinese tin, however, is perfectly suitable for use.

Tin is now so expensive that it has been found very profitable to remove it from old tin plate scrap of which there is a vast amount used in the manufacture of tin cans and cooking utensils. The following is the analysis of the tin obtained in such a manner by Theo. Goldschmidt of Germany. The analysis is the best grade made:

*Theo. Goldschmidt (From De-Tinning)*

| | |
|---|---|
| Tin | 99.860% |
| Antimony | 0.004% |
| Arsenic | none |
| Lead | 0.102% |
| Bismuth | none |
| Copper | 0.043% |
| Iron | trace |
| Silver | none |
| Sulphur | trace |

In addition to the preceding brands of tin, there is the so-called "scrap tin" on the market. This is a material to be avoided as it consists principally of block-tin pipe which is usually contaminated extensively with lead. The tin pipe may be composed of a tin lining and a lead covering and it is rare indeed that any source of supply of scrap tin can be obtained which is suitable for use in the tinning trade. It may answer for the brass foundry requirements, but for tinning it is not to be recommended and nothing will be saved by its use.

### *The Flux and Its Production*

Next of importance to the tin is the flux used. This is employed for the purpose of making tin adhere to the iron or steel. When iron or steel which may be chemically clean on the surface, is immersed in molten tin, no metal will adhere to it for the reason that there is present a slight film of oxide, although invisible to the naked eye, which prevents the tin from uniting with it. The object of the flux is to remove this film of oxide and produce an absolutely oxide-free surface with which the tin can unite.

The flux exclusively employed and which has been found perfectly satisfactory is chloride of zinc. Nothing better has yet been found and even at a greater cost there is nothing that will do as well.

The chloride of zinc used is made by dissolving metallic zinc in muriatic acid. Either scrap sheet zinc may be used (which is perfectly suitable as it is pure metal) or the ordinary spelter of commerce. For the sake of those who are not familiar with metallurgical terms, it may be said that the names *Zinc* and *Spelter* are the same and are used indiscriminately. For example, the sheet is always spoken of as "sheet zinc" while the slab metal or the raw material of commerce is called "spelter." Metallurgically both are the same. Chemically speaking, zinc is the right term. The chloride of zinc is made, as previously mentioned, by dissolving zinc in muriatic acid. Those who use large quantities of it can probably purchase it cheaper than they can make it from regular makers as it is obtained as a by-product in the treatment of zinc skimmings or sal ammoniac skimmings produced in galvanizing. Those who make a business of the manufacture of tinning flux can, therefore, usually sell it cheaper than it can be made. However, chloride of zinc is so easily made that there is always a temptation to produce it rather than purchase it. The method is simple:

Zinc is very soluble in muriatic acid (this acid is also called hydrochloric acid). Proceed as follows: Place a quantity of spelter or sheet zinc in the bottom of a stone-crock and then pour over it some strong muriatic acid. Care should be taken not to pour in too much acid or it will boil over. The acid acts upon the zinc at once and dissolves it with evolution of hydrogen gas. No light should be brought near the crock as the gas is inflammable. The operation should be conducted out of doors.

As soon as the action of the acid ceases, add more and allow the dissolving to go on. There should always be plenty of spelter in the bottom of the crock. If slab spelter, such as that shown in the illustration, is used, then the action does not go on as rapidly as with sheet zinc, but the result is the same. One has to be a little more careful in adding the acid to the sheet zinc so as to avoid the danger of boiling over.

As previously mentioned, there should always be an excess of spelter in the bottom of the crock and this will insure that all the acid is used up.

When there has been obtained sufficient material, no more acid should be added, but the whole should be allowed to remain until no more gas is given off. This will insure a neutral chloride of zinc containing no free acid. The object of having an excess of spelter in the bottom of the crock is to take up all the acid and thus obtain a neutral chloride of zinc.

If the chloride of zinc obtained contains free acid it does not work as well and the best results are always obtained when a neutral material is produced. This is an error frequently made when manufacturers produce their own chloride of zinc, but if care is taken to leave plenty of zinc in the bottom of the crock so that all the acid is used up, no difficulty will be experienced. The zinc that is left can be used again.

If crystals form when the zinc is dissolved or while it is standing after it has been made, then add just enough water to dissolve them. The best results are always obtained when the chloride of zinc is strong. If it contains water, then the water must be evaporated from the surface of the work by the heat of the tin bath before the chloride of zinc will act.

There are two things, therefore, that should be borne in mind and these are:

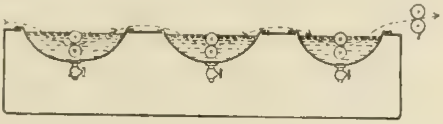
1. Have no free acid in the chloride of zinc.
2. Use it as strong as possible.

These difficulties are the ones that are usually encountered in making the chloride of zinc for tinning.

(*To Be Continued*)

## Coating Iron or Steel with Aluminum.

A method for coating iron or steel with aluminum has been patented in England by S. Uyeno of Tokio, Japan. The articles to be coated such as for example, pipes, strips, wire, etc., are first tinned or galvanized and then immersed in a vessel or in two or more vessels containing molten aluminum. While so immersed, the articles are swept or rubbed by steel brushes or their equivalent so that the tin or zinc coating is replaced by the aluminum. It is stated that the articles may then be rolled, pressed or polished.



When tin is used as the preliminary coating, the aluminum becomes contaminated with it after some time. To remove it, lead is added to the aluminum bath in a quantity of not less than twice the quantity by weight, stirring and allowing the tin and lead alloy to settle after which it may be drawn off through the cocks in the bottom of the melting kettle.

When zinc is used as the preliminary coating, the contaminated aluminum may be freed from it by heating the aluminum to drive it off.

## Fugitiveness of Arsenic Finishes.

In the past, arsenic was a favorite material for the production of gray or black finishes on metals and, as these finishses are easily produced either by simple dipping or by the electrodeposition of an arsenic solution, the method was, naturally, quite attractive. The process is also cheap.

Of late, a change has occurred and these arsenic finishes are used far less extensively than formerly and many have abandoned them entirely. The change has been caused by their fugitive nature.

Arsenic is a peculiar material. It is grayish black and oxidizes in the air, particularly in a warm, moist atmosphere, to the arsenic oxide which is white. This oxide is known as "white arsenic" or arsenious oxide. When the finishes obtained by the use of arsenic are put on a metal surface, metallic arsenic is the substance that is deposited, and when this is exposed to the air, it gradually changes (frequently quite rapidly if the air is damp and warm) to white arsenic or the oxide and this becomes powdery and easily rubs off. It also becomes almost invisible on a white metal.

It is this feature of oxidizing which renders the use of arsenic in producing gray or black finishes on metals so treacherous and which has resulted in a costly experiment to many manufacturers. A case in point was a manufacturer of silver plated flat-ware who sought a suitable and cheap finish for the production of a French gray finish on the silver. Arsenic seemed to be excellent for the purpose on account of its cheapness and the ease with which it could be put on. It was, therefore, used.

The flat-ware was given a French-gray finish by means of arsenic and an excellent appearance it had, too, so that the manufacturer congratulated himself that he had obtained a good method for producing the finish.

After the goods had been sent to the customers some time complaints began to come in that the French-gray finish had disappeared, even while in stock at the store of the merchant and before the flat-ware had been in use at all. Naturally this was quite perplexing at first, but investigation soon proved that it was caused by the arsenic and the oxidation of which produced the trouble. A close inspection of the goods revealed the fact that the arsenic had actually oxidized to white arsenic and that this white arsenic remained on the surface of the silver in the form of a white powder that could be easily wiped off.

The question in regard to the use of arsenic resolves itself into one of whether the goods are to be lacquered or not. Lacquer protects the arsenic from oxidation for as long a time as the lacquer itself remains intact and the finish under these conditions can be called permanent. The reason, of course, is that the lacquer prevents access of the air to the arsenic and thus prevents oxidation. If, on the other hand, the arsenic finish is not lacquered then it will oxidize and "disappear" every time and it is a waste of time to use a finish of this nature. The worst of it is that it does not fade in the shop of the maker of the goods, but in the store of the merchant who purchases them from the manufacturer and this, of course, may mean the loss of many good customers.

Therefore, if arsenic is to be used for producing a finish on metal, then it should *invariably* be lacquered, otherwise fading will result in a short time.

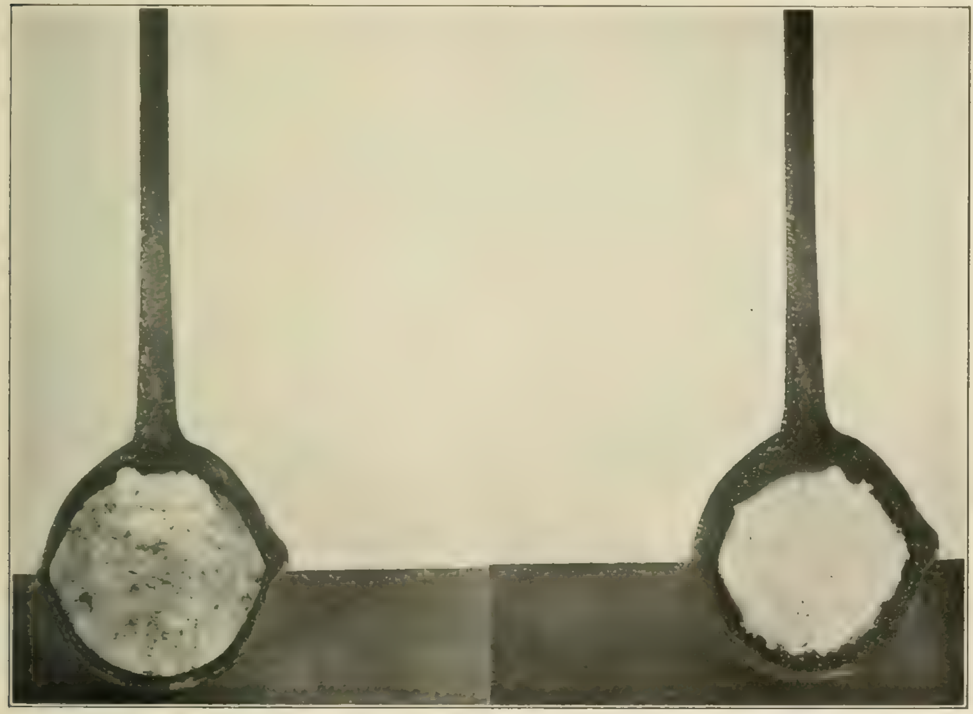
## New Books.

PRACTICAL PATTERN MAKING—by F. W. Barrows. This book, now in its second edition, is a comprehensive and entirely practical treatise on the subject of pattern making, illustrating pattern work in both wood and metal, and with definite instructions on the use of plaster of paris in the trade. It gives specific and detailed descriptions of the materials used by pattern makers and describes the tools; both those for the bench and the more interesting machine tools; having complete chapters on the Lathe, the Circular Saw and the Band Saw. It gives many examples of pattern work, each one fully illustrated and explained with much detail. These examples, in their great variety, offer much that will be found of interest to all pattern makers, and especially to the younger ones, who are seeking information on the more advanced branches of their trade. The publishers are the Norman W. Henley Publishing Company, 132 Nassau St., New York City, and the price is $2.00 postage paid.

## Removal of Zinc from Antimonial-Lead, Solder and Babbitt.

Small quantities of zinc will frequently enter antimonial-lead, solder, babbitt or other similar alloys, particularly if scrap is used. The presence of this small amount of zinc will frequently ruin the metal, and to reclaim it, the zinc must be removed.

In the case of these alloys, the effect of the zinc is the same, namely: It renders the molten metal drossy so that it does not run freely and in the case of castings, it does not fill the mold well. Even a small amount of zinc can be plainly detected by an experienced person.



Antimonial-Lead Containing Zinc. Before and After Treating with Sal-Ammoniac.

The removal of the zinc is not a difficult operation, provided too much is not present and *sal-ammoniac* is the material employed for the purpose. The method used is as follows:

Melt the metal in an iron kettle and heat somewhat hotter than would be used for pouring it. A temperature about that of molten zinc is suitable as at a lower temperature the sal-ammoniac does not act as well. When melted, throw a handful of sal-ammoniac on the surface of the metal and stir well. The powdered or granulated sal-ammoniac should be used as this spreads out on the surface of the molten metal better and acts on a greater quantity of metal. The lump sal-ammoniac does not answer as well.

In adding the sal-ammoniac, of course, considerable smoke is produced but this cannot be helped and strong ventilation is required to remove it. The addition is continued until the metal pours well and free from the film which is produced on the molten metal when zinc is present. This point may easily be ascertained by a trial pouring. When the zinc has been removed from, for example, good solder, the molten metal will run free and with a perfectly clear surface. If zinc is present, the stream will have a thick and drossy appearance.

The sal-ammoniac apparently removes the zinc by converting it into chloride which forms a slag on the metal as may be readily seen when the operation is carried out.

## Scrap Aluminum Sheet.

As there is now a large amount of aluminum sheet used for various purposes, there is produced a corresponding amount of scrap in the form of clippings, punchings, etc. Manufacturers who produce this scrap are always desirous of obtaining as much as possible for it and are frequently annoyed at the small price that can be obtained for it as scrap. It is now and then desirous of casting it into slabs and re-rolling it into sheet again and this has been tried by a number of manufacturers without success.

Aluminum is a peculiar metal and its properties are far different from those of bronze or brass. When melted it oxidizes readily and the oxide, being practically of the same specific gravity as the aluminum itself, does not float to the top of the metal readily but intermingles with the metal and remains in it when poured. The oxide, however, is white and is not visible in the metal except by making a microscopic examination. It is this oxide which causes the difficulty when the metal is rolled.

The oxide intermingling with the metal, when scrap aluminum is melted, causes veins throughout the metal which, when pressure is put upon the metal as it is in rolling, cause it to crack. All forms of scrap aluminum seem to cause this difficulty, but thin sheet scrap, such as clippings, trimmings, chips or punchings, present so much surface when the aluminum is melted that there is a large amount of oxidation with the result that the cast metal is filled with the oxide and invariably cracks in rolling.

Slabs or bars made from re-melted sheet aluminum scrap always have a good appearance if the right heat is used and the mold is suitable but the casting will not roll and always cracks.

The use of chloride of zinc as a flux in melting the aluminum will improve matters as it removes the oxide to some extent, but it does not appear to solve the problem. There is another matter which undoubtedly has a direct bearing on the deterioration of aluminum when melted and that is the absorption of nitrogen from the air during melting. It is known that it does absorb this gas and that the metal is rendered brittle by its presence. While there is not very much known on the subject, the presence of nitrogen in the metal, like that of the oxide, is injurious.

Aluminum is injured every time it is melted and, after it has been melted many times, it is unfit for the manufacture of anything but the poorest castings or for use as a deoxidizing agent. The only way that scrap can apparently be made into metal that will roll again is to melt it and electrically refine it in the same way that new aluminum is reduced from the ore. It is cheaper, however, to make the scrap sheet into casting metal for making sand castings as there is always a good market for them and the re-melted metal, provided it is properly alloyed with hardening metals, is perfectly suitable. An excellent casting metal is to alloy the aluminum with 8 per cent. of copper and this mixture is more extensively used for making sand castings than any other.

## A New Molding Compound.

A new molding compound has been patented by Edward D. Gleason and is composed of the following ingredients:

| | |
|---|---|
| Powdered Soapstone ...... | 11 parts |
| Portland Cement .......... | 1 part |

These two ingredients are mixed and then wet with a solution made of:

| | |
|---|---|
| Water .................... | 2 parts |
| Water Glass ................ | 1 part |

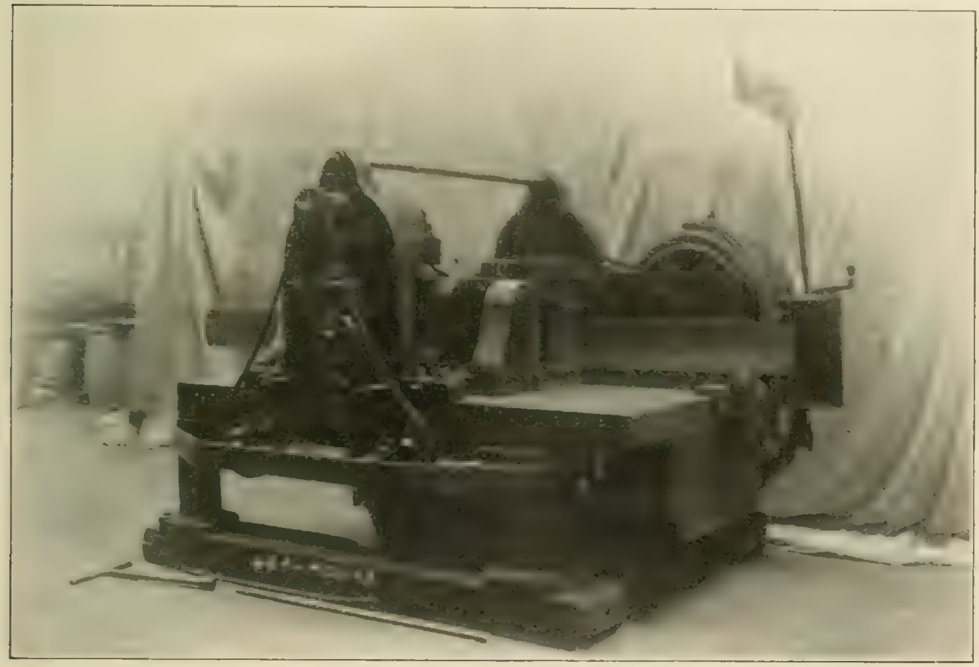
This solution is used to wet the mixture and give it the consistency of ordinary molding sand.

The molding is carried out in the same manner that ordinary molding sand is used, or may be poured over the pattern, when of the consistency of thick molasses, and allowed to set for 48 hours when it will be of the consistency of hard soap or wax. The flask is then placed under a hydraulic press and subjected to pressure and the surplus liquid pressed out.

The mold, after the patterns have thus been removed, is heated to a temperature of from 300 to 500 degrees F. and thoroughly dried. The mold is then ready for use. It is stated to be extremely durable and capable of resisting the action of metal at 1500° F. The mold can be used as a permanent one.

## A New Rotary Overhauling Machine for Brass, German-Silver, Etc.

Brass, or other metals cast for rolling, has a surface that is unfit for the production of good sheet and this surface must be removed before a satisfactory material can be produced. To be sure, sheet brass suitable for some purposes can be made without overhauling the cast bar, but not for other purposes. The great majority of sheet brass made is produced from the cast bar which has been overhauled.



New Form of Rotary Overhauling Machine for Brass, Bronze, Copper, German-Silver.

The bar of brass cast in an iron mold for rolling into sheet has a rough surface and contains more or less small particles of dross and carbon which are given the name of "spills". It is the object of the overhauling to remove these imperfections and leave a clean metal surface for rolling.

The overhauling of brass is also called "scalping" or "scraping" and has always been practised. For years it was done with a hand scraper, then the Stever overhauling machine made its appearance and was the first power machine. Then the large and powerful Stever machine followed and this is now extensively used. This machine uses a tool like the hand scraper and it is drawn over the surface of the brass in a manner similar to a hand tool except, of course, a heavier cut is taken. The depth of cut may be regulated by the operator and, if it is desired to dig down deep to remove a certain piece of dross or charcoal, then the operator of the machine easily accomplishes it by a pedal.

The fact that the depth of the cut can be regulated so that any desired imperfection in the brass may be removed without taking off any more than is necessary from other portions of the surface, has always been an attractive feature of the Stever machine and by means of it, it has been possible to overhaul a bar of brass with the minimum production of waste in the form of chips.

A new form of rotary overhauling machine has recently made its appearance on the market which is capable of turning out a large amount of work per day. This machine is herewith illustrated and is the invention of James M. Chatfield and Karl W. Hallden of Thomaston, Conn. The machine differs from the Stever machines now in use in that a uniform cut is taken from the surface of the bar. While this produces a greater amount of chips than the Stever machine, the quantity of work produced per day is so great that it renders the difference in the quantity of chips negligible.

The machine is operated by two men and is handled like a wood planer except that the bars are passed into the machine on end.

There are three different speeds of the feed rolls. The bars, up to 8 inches in width, are passed through the machine at the rate of 6 feet 4 in. per minute. Both sides of the bars are overhauled at the same time, and as soon as one bar is clear of the machine, another may be fed into it. The output is 75 bars an hour or 400 sq. feet of surface per hour. It will be appreciated ,therefore, that the output of overhauled bars from the machine is about ten times that of the modern Stever or reciprocating machine.

The machine is used for overhauling brass, copper, bronze, German-silver, sterling-silver and other metals and alloys which may need such treatment.

## Melting Point of the Refractory Oxides.

The U. S. Bureau of Standards of Washington, D. C. have recently determined the melting point of the refractory oxides and the results have cleared up much mystery that has always existed in regard to this matter.

The melting points determined were those of magnesium oxide, calcium oxide (lime), aluminum oxide (alumina) and chromium oxide. The determinations were made with the customary accuracy of the Bureau of Standards . The greatest difficulties were found in avoiding smoke (which would give low temperature readings) and the prevention of the contamination of the oxide by the material used as a support.

The magnesia was melted in graphite, the aluminum in graphite and in tungsten, the chromium oxide in tungsten and the lime in tungsten.

The results obtained were as follows:

*Melting Points*

| | Centigrade | Fahrenheit |
|---|---|---|
| Magnesium oxide (Magnesia) | 2800° | 5072° |
| Calcium oxide (Lime) | 2572° | 4661° |
| Aluminum oxide (Alumina( | 2050° | 3722° |
| Chromium oxide | 1990 | 3614 |

These determinations will be found very useful in the manufacture of fire bricks, crucibles ,and other refractories and up to this time no accurate determinations appear to have been made.

## How to Prevent Cheap Brass Goods from Tarnishing.

There is a large variety of cheap brass goods manufactured which will not warrant anything but the cheapest material being used on them. They are made of solid brass and of brass plated steel. When completed and assembled they are dipped, if of solid brass, or if brass plated, left in the bright brass as they come from the plating tank. In either case, the brass must be protected from the air, otherwise it would discolor in a short time and finally turn black.

Now the goods are so cheap that the use of regular lacquer on them would be out of the question, and as no finish is required and only a protection is necessary, the cheapest material for the purpose must be employed. It is customary in the metal trades which make these classes of goods to use a very weak shellac varnish for the purpose and it has been in use for many years. The following proportions are used:

| | |
|---|---|
| Denatured Alcohol | 1 gallon |
| Flake Shellac | 1 oz. |

Dissolve the shellac in the alcohol and then strain it through cloth to remove the sticks and dirt in it and it will be ready for use.

The brass goods, after dipping and drying are immersed in the shellac and then dried. The goods should be warm when used. The heat of the drying over will, of course, expel the excess of alcohol and leave a film of shellac on the surface for the protection of the brass.

The drip on the goods will not bother one as the shellac is so weak that it will dry right off, although a slight spot will be left. The goods are so cheap, however, that a perfect surface is not expected and protection against tarnishing is all that is required.

By dissolving a greater or less amount of shellac in the alcohol a stronger or weaker material may be obtained, but it should be used weak in order to dry rapidly and give an invisible film on the surface of the brass.

## Gold Plating Cast-Iron Novelties.

**By William J. Schneider.**

This is the age of new discoveries, especially in the line of chemistry, and with such applied chemistry we are able to make great strides and improvements. The subject which I am about to discuss is one of extreme importance to the electroplating industry. There has been a great deal written upon this subject but more or less of it has been of a theoretical nature with but little benefit to the practical plater. The subject of copper, brass, and gold plating with Trisalyt is of extreme importance to a practical man and I hope herein to bring out its many advantages, which it has over the older methods of electroplating.

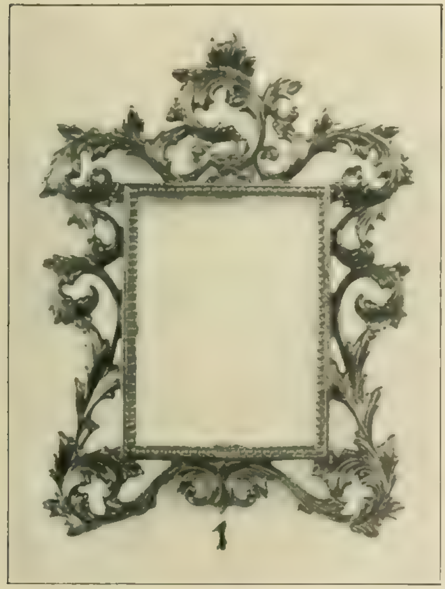


Fig. 1. The Cast-Iron Frame.

The first consideration of the advantages of this salt should be in regard to the quality of the work turned out with the minimum production of poor work when compared with the other methods. The greatest requirement that a manufacturer makes of a plater is for uniform work from day to day with the least amount of trouble.

This is an important feature that some of the processes now in use are lacking and in this respect Trisalyt shows itself particularly efficient. Most platers will admit that when chlorides and carbonates are present in the plating solution it is difficult to maintain uniformity, particularly in the case of brass or gold plating. This is possibly due to various inert salts and foreign matter which are found in the chemicals. The Trisalyt method of plating which I am advocating avoids these difficulties and it is due to the purity of the chemicals employed in the making of this material. The difficulties which the plater encounters in the use of Trisalyt are so few and of such a trivial nature that they are scarcely worth mentioning and the simplicity of the process speaks for itself. Once the solution is made up with the regular amount of Trisalyt and sufficient current used, and the work properly prepared in the usual manner, very little care is required on the part of the plater.

Let us next take the convenience and safety of the Trisalyt method. In the ordinary process ,aside from the unnecessary work involved in the operations, the plater is in danger from injurious gases occurring while mixing his cyanide and carbonates together before placing in the regular solution; and in case he has any cuts on his hands, he is open to the contraction of cyanide poisoning. In the use of Trisalyt this danger is eliminated. Use warm water, place the required amount of Trisalyt in a crock, and add to solution when replenishing.

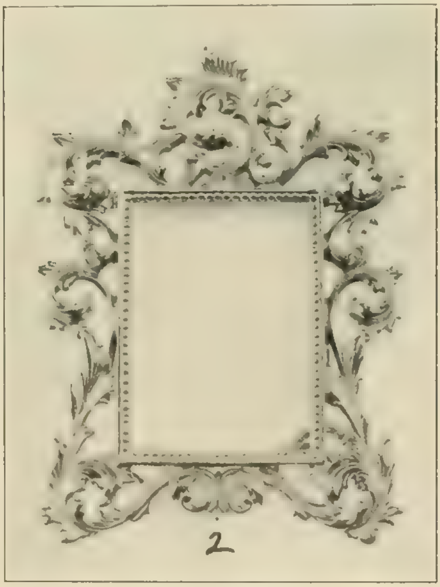


Fig. 2. Brass Plated.

Trisalyt dissolves readily to a clear solution. From an economical standpoint the method is cheaper in the long run and is due to the purity and superior conductivity of the salts which act upon the anodes thereby replenishing the bath more evenly from that source.

In conclusion I will now give to the plater a description of a few samples of gray-iron (herewith shown) which were plated with Trysalyt without any loss. These were plated in lots of 1200. The castings shown are picture frames. They were pickled and cleaned in the usual manner and then plated in a warm copper solution for about 40 minutes. The bath was made from copper Trisalyt. The frames were then rinsed in cold water, dried and dipped in a bright acid dip, after which they were rinsed, dried and polished in the high lights. They were next brass plated in a solution made from Trisalyt copper and zinc with a little aqua-ammonia for about 5 minutes and then rinsed thoroughly, after which the frames were plated in a gold Trisalyt solution with the addition of a little phosphate of soda and sulphite of soda.

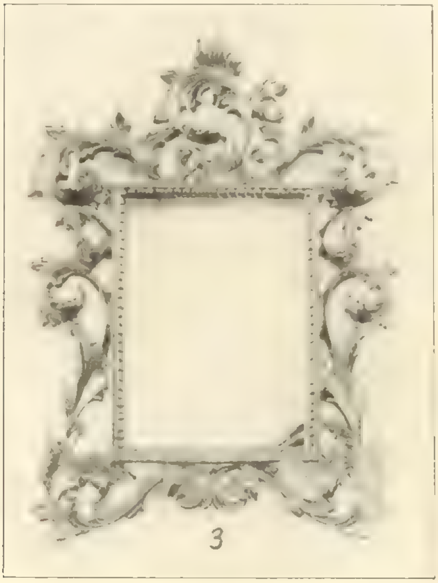


**Fig. 3. Gold Plated.**

A weak current is used. The temperature of this solution is kept at about 160° F.

The economy of the process may be appreciated when it is known that 400 of these cast-iron picture frames were plated with 1 oz. of gold Trisalyte.

The manufacturers of these frames turn out approximately 250,000 annually without any rejection which formerly amounted to a large percentage due mainly to "spotting out." This feature has been entirely eliminated since the Trisalyt was adopted.

## Electrolytic Cleaning of Iron and Steel.

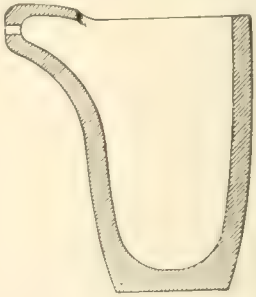
A new process for the electrolytic cleaning and pickling of iron or steel that is to be subsequently electroplated has been patented in England by Pascal Marino. The solution is made up as follows:

| | |
|---|---|
| Water ........... | 1 gallon |
| Boron Fluoride .......... | 2 oz. |
| Sodium Fluoride ........ | 2 oz. |
| Tin Fluoride ............ | 2 oz. |
| Hydrofluoric Acid ....... | 1 oz. |

The articles to be cleaned are first made the anode and afterwards the cathode. A current density of 2 amperes per 15 sq. in., it is stated, should be employed and at 2 to 4 volts. As anodes, the surface of the tin or steel is freed from sand and oxide, and as the cathode it receives a firmly adhering coating of tin which renders it suitable for subsequent tieatment.

## A New Form of Crucible.

A new form of crucible for melting metals has been designed by the Morgan Crucible Company, Battersea Works, London, England, the extensive English crucible manufacturers.

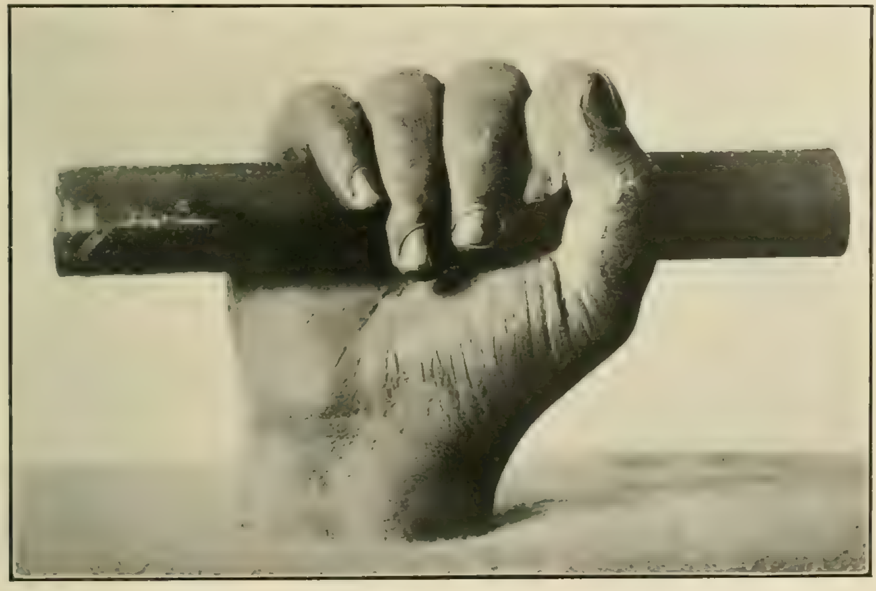


The crucible is made with a spout or tubular extension at the lip and through which a hole is made for the passage of the molten metal. The surface of the metal is covered with charcoal and the spout is used to prevent the outlet of this charcoal and dross.

## A Metal Casting Direct from a Human Hand.

It is rare that a casting of a portion of the human body is ever attempted, but one is herewith illustrated. It is a casting of a human hand representing a fine job of work. The method of making the casting was as follows:

The hand was allowed to grasp a rod as shown, in order to keep it in position readily while the cast was being made. Plaster of Paris was then poured around it, making provision by parting for the removal of the necessary portions of the plaster to release the hand after the plaster had set. The hand was oiled before the plaster was poured around it in order to avoid any adherence when it had set.



Casting Made from Human Hand by First Taking Plaster Cast.

When the plaster had set, it was removed from the hand in the pieces so that all undercut portions were removed intact and when again put together a mold was formed. The plaster was then well dried and put together to form the mold, and soft metal poured into it forming the casting. A bronze mold could have been made of the plaster, in case a large number of castings were to have been made, but as only one was produced the plaster mold answered all purposes.

The molding and casting of this interesting object were performed by Charles H. Poland of Bridgeport, Conn.

## A New Process of Metallizing Ceramic or Stoneware Surfaces.

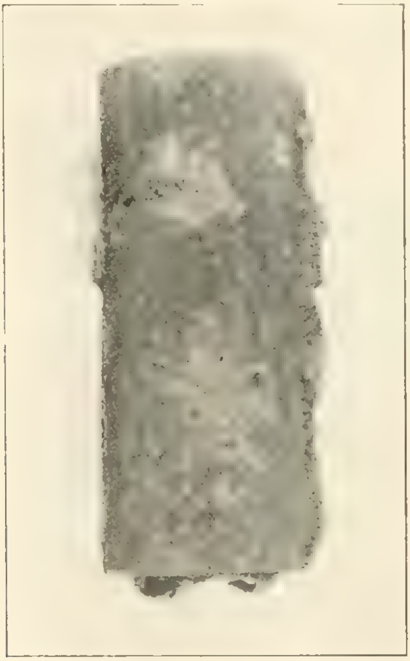
Quintin Marino of London, England has patented a method of metallizing ceramic or stoneware surfaces in the following manner:

A fluoride of the metal to be applied is first made by dissolving the carbonate of the metal in hydrofluoric acid. In case copper is to be applied to the surface, then the carbonate of copper is used for dissolving in hydrofluoric acid. The fluoride thus prepared is applied to the ceramic surface and dried. The next step is to reduce the metal and this is accomplished by means of zinc, aluminum or magnesium or by rubbing the surface with a brush made or coated with such a metal. A stream of reducing gas, such as coal gas may also be employed.

The process is applied more particularly to the application of metallic iron to such surfaces and iron fluoride is employed. Aluminum or magnesium is used for reducing it to the metallic condition.

## Slag Spots in Phosphor-Bronze.

Phosphor-bronze cannot be treated in the brass foundry in the same manner as yellow brass or composition for the reason that the phosphorus in the metal has a strong affinity for iron and the ordinary iron stirrers or skimmers ought not to be used. To be sure they can be used, but a simple trial will convince a person that a large quantity of iron will enter the bronze during a simple melting or even a slight skimming.



**Phosphor-Bronze Casting Showing Slag Spots.**

Take a pot of phosphor-bronze and stir it with an iron rod of half an inch diameter for a few minutes and the iron will be partially dissolved. The surface of the metal, however, will remain clear and there will be no indication that there is any abnormal condition. The same will be true with the casting, unless a very large amount of iron is present. However, when the iron is dissolved, more slag forms on the top of the metal and this is very difficult to skim off. The result is that the slag enters the mold with the metal and forms slag spots such as shown in the bushing illustrated herewith.

The more phosphorus there is in the bronze, the more eagerly will the iron be dissolved and the rougher the castings. In this particular instance, the bronze contained

| | |
|---|---|
| Copper | 87% |
| Tin | 10% |
| 15% Phosphor-Copper | 3% |

This mixture gives 0.45 per cent. of phosphorus which is too much. If reduced to half this amount, much better castings will be obtained.

### *Graphite Stirrers and Skimmers*

Any mixture containing phosphorus, either phosphor-bronze or similar alloys, should always be stirred and skimmed with graphite stirrers or skimmers. This will avoid the introduction of iron into the metal and prevent the formation of an excessive amount of slag on the surface. Iron stirrers and skimmers should, under no consideration, be employed.

The use of graphite stirrers and skimmers is now so extensive and has proved so necessary that all crucible manufacturers make them and carry them in stock. They are actually necessary in the making of all alloys or metals containing phosphorus.

## An Electrical Cure for Lead Poisoning.

At the provincial meeting of the Royal Sanitary Institute at Newcastle on October 18, Mr. T. M. Clague, Ph. C., gave a demonstration of the new process of electrolytic treatment of lead poisoning, discovered by himself. He stated that he was called in by a firm whose lead pipes had given out. He found an electric current near them, which appeared to explain the trouble, and after experiments confirming this struck the idea of applying the new fact to practical work. Sir Thomas Oliver, a great authority on industrial diseases had been good enough to carry out experiments, and it was found that by passing an electric current through the human body the lead was extracted. Several manufacturers had put in an installation, as soon as an employee showed any signs of the poisoning he was treated. Very good medical results had been obtained, and considerable quantities of lead extracted from the men treated.

Sir Thomas Oliver, who also spoke, described the symptoms of lead poisoning, and suggested that the weekly hot-water bath required by the Home Office might with advantage be made an electrical bath.—*The Ironmonger.*

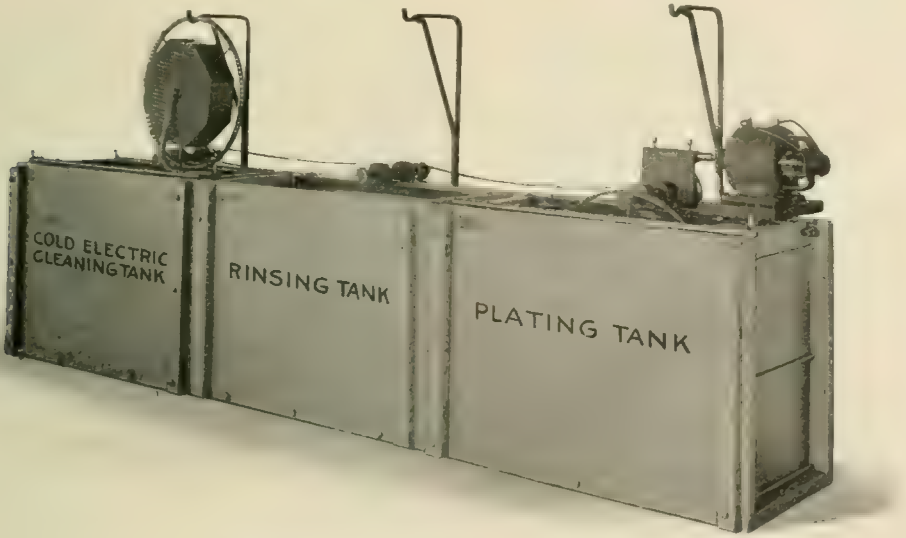
## Cleaning, Rinsing and Plating Metal Goods in One Operation.

In the electroplating of small metal goods in a plating barrel, the work must be cleaned before it is placed in the barrel and, after the operation has been completed, it likewise must be taken out of the barrel again for rinsing and drying. The cleaning is the most important preliminary operation and after this a thorough rinsing is necessary in order to avoid the introduction of any of the cleaning solution into the plating tank.

A novel electroplating apparatus has recently been placed on the market by the Bennett-O'Connell Company, 3600 South Morgan St., Chicago, Ill., the well known manufacturers of electroplating supplies and equipment. The apparatus is herewith illustrated. It consists of a three part tank in which the various solutions are held and which are separate so that each is equivalent to an individual tank. The objects to be plated are placed in a basket shown on the extreme end and lifted from the solution. This basket or barrel is suspended from a rotating sprocket.

The basket is then immersed in the cold electric tank at the extreme end and rotated by means of the chain operated by the motor. In from 5 to 10 minutes the work is cleaned in a very efficacious manner, depending, of course, upon the condition of the work before it is placed in the basket. Some work which is not particularly greasy or dirty can be cleaned in less time, but the length of time necessary may be easily ascertained by the plater.

The basket is now removed and placed in the rinsing tank in which it is revolved for a few minutes to remove all the cleaning compound. This tank contains running water the same as any rinse tank. The basket is now removed and immersed in the plating tank and the plating continued the necessary length of time when it is removed, the work rinsed and dried.

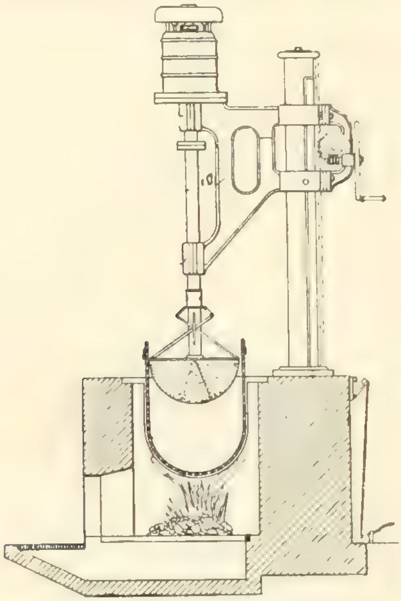


New Form of Plating Apparatus Which Cleans, Rinses and Plates Without Removing Articles from the Basket.

An excellent feature of the apparatus is that a low voltage is used and in no instance will more than 6 volts be required. No special dynamo is required, and as all plating rooms have a 6 volt machine, the apparatus can be installed without adding any extra equipment. Owing to the construction of the basket, the full value of the current is obtained and the amount of anode surface is exposed to the work that is being plated. The ordinary flat anode is used, and this fact, together with the use of a 6 volt current renders the apparatus particularly attractive.

## Galvanizing Small Articles.

The coating of small articles, such as screws, washers, or nails with zinc or tin is not as easy as that of large articles for the reason that unless the container in which they are held is agitated while the metal is cooling they adhere to one another. Making use of this principle H. P. Schmitz, of Dusseldorf, Germany has invented a process for galvanizing small articles which avoids hand labor. The basket or container in which the articles are situated is lowered in the bath of molten metal, after which it is hoisted and revolved by means of a motor. The surplus metal is thus thrown off by centrifugal action.


Apparatus for Galvanizing.

## Introducing Cobalt into Copper Alloys.

Among the common alloys, cobalt is attracting a large amount of attention and a number of valuable materials have resulted from experiments made with it. Cobalt is a metal very similar in appearance to nickel and, chemically, it is a member of the so called "nickel group" of metals. To the ordinary observer, both metals would have the same appearance, but to the trained eye, cobalt has a slight pink shade while nickel has a gray tint. Cobalt is malleable like nickel.

Cobalt seems to have the property of hardening other metals to a greater extent than nickel and, for this reason, it has been used in connection with chromium to produce the remarkable alloys which have surpassed steel as cutting tools. There are undoubtedly many other useful alloys containing cobalt that have yet been undiscovered.

The difficulty of using cobalt in making alloys has, heretofore, been retarded by the fact that cobalt melts at such a high temperature (cobalt melts at 2714° F. nickel at 2646° F. and iron at 2768° F.) that it is difficult to alloy it with the ordinary brasses and bronzes or other copper alloys. In order to facilitate this matter, the Goldschmidt Thermit Co., 90 West St., New York City, are making for the trade an alloy of copper and cobalt containing 10 per cent. of cobalt. It is easy to add a desired amount of cobalt to copper and the copper and cobalt alloy melts easily and can be introduced into the ordinary brasses and bronzes without difficulty. If it is desired to introduce it into a brass or bronze, it should be added with the copper in the crucible and allowed to melt with it. There is no danger of the cobalt oxidizing while melting.

## New Method of Treating Bullets and Projectiles.

An English patent has recently been issued to T. A. Bayliss and H. W. Brownsdon of the Kings Norton Metal Co. Ltd. of Birmingham, for a new method of treating bullets and projectiles. The method is as follows:

Bullets or the driving bands of projectiles are first roughened by means of a sand-blast. They are then coated with a solution of sodium silicate in water (water glass) and in which kaolin is suspended. A hard coating is left upon drying and which does not rub off on the barrel of the fire-arm, nor prevent the bullet or projectile from taking the rifling of the barrel.

After the water-glass has dried on the bullets, they are given a protective coating of paraffine or shellace varnish. If in addition to the cement coating, the bullets receive a thin coating of a lubricant, such as beeswax, the bore of the rifle becomes, after continued firing, even more highly polished than a new barrel.

## Chemicals Used in Electroplating.

### Ammonia.

The ordinary ammonia used by the electroplater is known by a number of different names. They are as follows:

1. Ammonia.
2. Ammonia Water.
3. Aqua Ammonia.
4. Ammonium Hydrate.
5. Ammonium Hydroxide.
6. Spirits of Hartshorn.
7. Liquid Ammonia.

The term ammonia is the one most extensively employed and while short and satisfactory yet results in a little confusion as will be explained.

**The Manner in Which Small Quantities of Ammonia are Shipped.**

Ammonia always occurs in liquid form and consists of a solution of ammonia gas in water. Chemically speaking, ammonia is a gas and ,of course, cannot be used so. In order to render it portable and capable of being used, the gas is passed into water which absorbs it eagerly and in a large quantity and thus the ammonia water or aqua ammonia of commerce is obtained. The ammonia gas is so readily absorbed by water that the strongest ammonia water of commerce contains (specific gravity 0.89) over 30 per cent. by weight of ammonia gas. A liquid is thereby obtained which answers all purposes and is practically a liquid gas. Ammonia water, therefore, is water containing all the ammonia gas it will dissolve.

Owing to the fact that the ammonia water is water containing all the ammonia gas it will absorb, it should be kept cool and tightly stoppered. When warmed, the ammonia gas escapes and also if left exposed to the air. Under these conditions, the ammonia water becomes weaker and weaker until, after a long time, nothing but pure water is left. If, however, the ammonia water is kept in a cool place and tightly closed, it will retain its strength almost indefinitely.

Ammonia water is used in a number of electroplating operations. In brass solutions it is used and in nickel baths for neutralizing the free sulphuric acid in them. It is also employed for making fulminate of gold by precipitating a gold chloride solution.

Ammonia water occurs in commerce in two forms: First, the commercial ammonia water. Second, the chemically pure article.

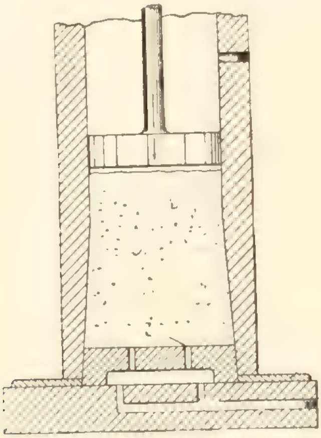
The commercial ammonia water of commerce is quite pure and is perfectly suitable for all electroplating operations. In fact, it is one of the purest of commercial chemicals and there is never any need of employing the chemically pure material as it causes a useless additional expense.

The chemically pure ammonia water is used only in chemical analysis or other chemical operations requiring a material absolutely free from foreign matter, even traces.

Ammonia is made from the gas liquor obtained in the manufacture of gas from coal. The liquor is a by-product and, among other things, ammonia compounds are obtained. By treating with lime and distilling, the ammonia gas is freed and passed into water which absorbs it and produces the ammonia water of commerce.

## Cabbaging Scrap Metals in a Vacuum.

According to an English patent recently issued to H. M. Punnett, scrap metal may be more closely cabbaged and in a very compact form if carried out in a vacuum. Cabbages thus made contain less air and melt with less loss.



Compressing the Scrap in a Vacuum.

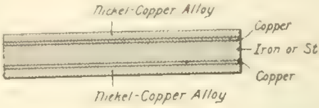
The material to be cabbaged is placed in a tapered cylinder and compressed by a piston operated by hydraulic pressure. The interior of the cylinder is exhausted from air by means of a suitable air pump and then the piston is forced down upon the scrap rendering it a compact mass.

## Coating Steel with Monel-Metal.

A process for coating steel with Monel metal has been patented by Truman S. Fuller of The General Electric Company of Schenectady, N. Y. and which is carried out in the following manner:

A steel base which preferably contains 0.13 of carbon and 0.36 of manganese, is used. On this a sheet of copper is placed and then the Monel metal with which the steel is to be coated. The whole is now heated in an atmosphere of hydrogen until the Monel-metal melts and the latter will unite firmly with the steel so that the compound billet or ingot obtained may be rolled into sheet and drawn into wire without difficulty. The inventor states that microscopic examinations show that no flaws exist at the joint. It is furthermore stated that no pressure is required during the heating to bring about the union of the Monel-metal and the steel.

The use of the copper between the steel and the Monel-metal, it is stated, is the reason for the strong union of the two metals. Among the uses for this compound metal in the form of sheet are lining for water-tanks, ovens manufactured for cooking utensils and for electrically heated apparatus where a high temperature is produced.



The Steel Coated with Monel-Metal.

Monel-metal is a nickel alloy containing about 2 parts of nickel and 1 part of copper with a little iron. The inventor states that other nickel alloys high in nickel, or pure nickel may be coated on the steel in the same manner.

## Making a Compound Sheet of Aluminum and Antimonial-Lead.

A method of making a compound sheet of aluminum and antimonial-lead, or aluminum and britannia metal, has been patented by Lewis W. Tebbetts 2nd, of the Hoyt Metal Company of St. Louis, Mo.

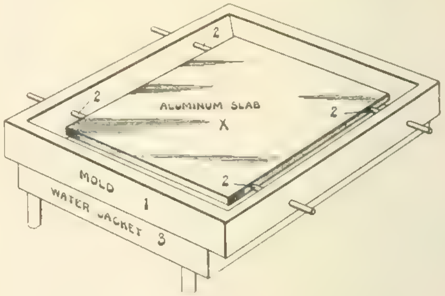


Fig. 1. Method of Holding the Aluminum Plate.

A plate or sheet of rolled aluminum is designed by X in Fig. 1 and is held in place by clamps as indicated in the illustration. The soft metal is next poured into the mold and is in sufficient quantity to enclose the aluminum slab. The cooling of the ingot may be hastened by a water jacket if desired and there results a slab composed of aluminum on one side and the soft metal on the other It will have the appearance indicated in Fig. 2.

The compound slab is then rolled in the usual manner and a compound sheet obtained. It is claimed that this method is superior to that employed for producing the compound metal and which consists in fusing the two metals together and then rolling as there results an alloy of the two metals at the junction which materially detracts from the ductility of the metal.

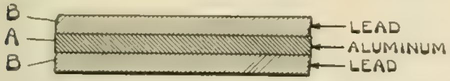


**Fig. 2. The Lead Coated Aluminum.**

Instead of antimonial-lead or britannia-metal, any ductile alloy such as solder or a single metal like tin may be used and a similar compound sheet obtained.

## A New Form of Soldering Stick.

A new form of soldering stick has been patented by Ludwig Maes of Bonn, Germany and which is made of a tube of the soft solder to be used and then filled with a mixture of finely divided solder and a flux.

The tube used is made of a good quality of soft solder, either half and half or two parts of tin and 1 of lead. It is made of small size in order to facilitate its use and of a thickness which will stand use without collapsing. The interior is filled with a powder of the same solder used for the tube and mixed with a flux of sal-ammoniac and glycerine.

When used, the soldering may be done directly and the end of the tube melts down, thus preserving the remainder of the interior from oxidation until further required for use.

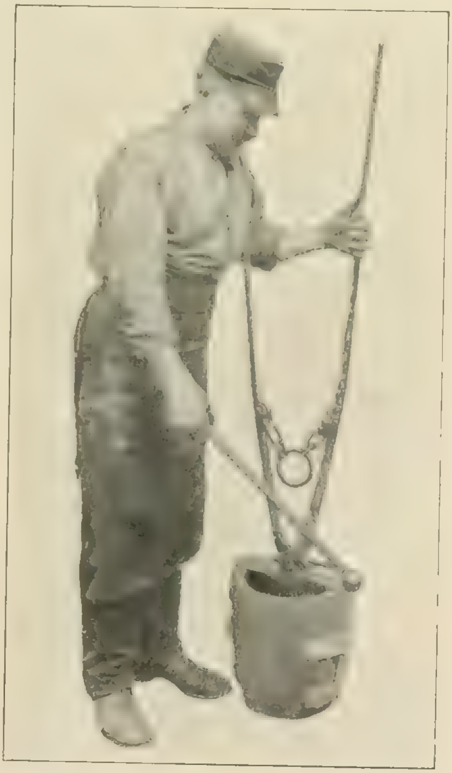
## An Aluminum-Bronze Containing Boron.

The use of boron in aluminum bronze has recently been patented by Edward D. Gleason of New York City. It is claimed that such an alloy does not tarnish as readily as the bronze without the boron, and has superior physical properties.

The method of making it is as follows: Aluminum is fused in a crucible under a layer of a mixture of 3 parts of fluor spar and 1 part of boracic acid. The heat used is quite high so that boron fluoride forms which reacts with the aluminum and boron is reduced. The boron thus reduced is absorbed by the aluminum forming an alloy. This aluminum and boron alloy is used in the proportion of 10 parts to 90 parts of copper to make an aluminum-bronze. The alloying is done under a layer of charcoal and black oxide of manganese.

## Adjusting Crucible Tongs.

After crucible tongs have been in use for some time they become too large to fit the crucible and much annoyance is then caused on account of the crucible slipping out. A blacksmith is then required for repairing them, and even then he frequently fails to make a good fit.



**Method of Using the Iron Pot for Shaping Tongs.**

A new and very satisfactory method of shaping crucible tongs is the use of an iron crucible around which the tongs are placed while hot and then hammered into place. The iron crucible is of the same contour as the graphite crucible which the tongs are to fit. The method of treating is as follows:

The tongs are heated in a fire to a red heat and then placed on the iron crucible in the same manner as they would be used on a graphite pot. They are then hammered into shape and allowed to cool. Any melter may thus shape his own tongs and whenever it may be required. The "crucible form" as it is called is manufactured and supplied to the trade by E. R. Klemm, 1447 Austin Ave., Chicago, Ill.

## A Compound Tungsten Electrode.

A method of making a compound electrode of tungsten and platinum or tungsten and iridium has been patented by Royale H. Stevens of Salt Lake City, Utah. The object is to obtain an electrode for use in the electrolytic refining of metals or for other similar purposes where a particularly inert metal is necessary and for which solid platinum or iridium would be too expensive.

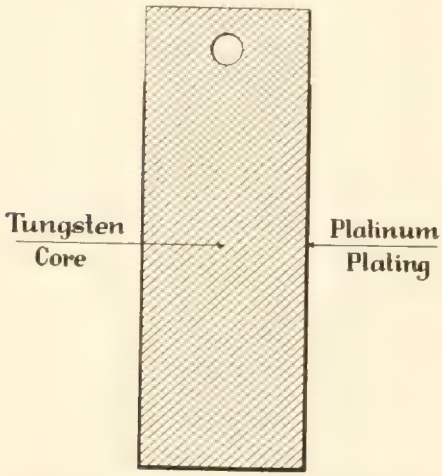


**Illustration of the Manner of Making the Electrode.**

The method used consists in first making the tungsten electrode in the shape desired and then plating with platinum or iridium. The plating, in the case of platinum, is carried out in a solution of platinum chloride containing sodium phosphate and made slightly acid with phosphoric acid. A similar solution is used for the iridium except that chloride of iridium is used. The following proportions are employed:

*For Platinum*

| | |
|---|---|
| Water .............. | 1000 parts |
| Ammonium Phosphate .... | 50 parts |
| Di-Sodium Phosphate .... | 250 parts |
| Platinic Chloride ........ | 5 parts |

The solution is boiled until all free ammonia is expelled.

For plating the tungsten with iridium the following solution is recommended:

*For Iridium*

| | |
|---|---|
| Water .................... | 1000 parts |
| Ammonium Phosphate ... | 50 parts |
| Di-Sodium Phosphate .... | 250 parts |
| Iridium Chloride ......... | 5 parts |

The solution is boiled until all the free ammonia has been driven off and it is then ready for use.

The current density used in both instances is about 0.05 amperes per square decimeter. From 1.2 to 2 volts are required. The inventor makes the following statement regarding the peculiar qualities of metallic tungsten:

"The tungsten electrode will act as a cathode before it is plated, but when used as an anode in a sulphuric acid solution will not conduct electricity. There are some solutions in which the unplated tungsten will act as an anode, but the anode will deteriorate and the platinum or iridium coating is used as a protection; and when plated becomes as good a conductor as solid platinum. By reason of its cheapness is to be preferred to the solid metal. The high melting point of the tungsten renders it useful for many electric furnace purposes."

## Use of Sulphur in Making a Bronze High in Lead.

Some patents have recently been issued to Edward D. Gleason of New York City of the Plastic Metal Co. of the same place upon the use of sulphur for holding lead in a bronze. It is well known if a bronze containing a large quantity of lead (say 50%) is cast in sand, the lead will sweat out in layers or spots so that the casting is not good. The method of making the alloy is as follows:

In a crucible are fused 60 lbs. of copper and, when melted, 5 lbs. of galena are introduced.

Galena is a sulphide of lead and is the principal ore of lead found in nature. It has a lead color but is hard and brittle. Then 30 lbs. of lead are added and 5 lbs. of tin. The metal is poured into pigs or castings as desired. These proportions of metals may be varied as desired. The lead, it is stated, will not sweat out as the sulphur in the metal holds it in so that segregation or liquation does not take place.

## Formula for Cock Grease.

Gas-cocks, water-cocks, and similar ground key goods usually require a grease on the key so that it will turn smoothly. Oil is unsuited for the purpose for the reason that it will not remain on the key. The same is true of thin grease. What is wanted is a heavy, fibrous grease and one that will remain on the surface of the key under all conditions.

Article on Which the Cock-Grease is Used.

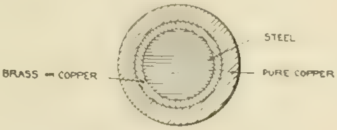
The following cock-grease has been used for years in many of the largest establishments making gas-cocks, plumbers' goods and ground key work. The formula is as follows:

| | |
|---|---|
| Beeswax | 1 part |
| Tallow | 1 part |

The two ingredients are melted together in an iron kettle and stirred with a stick of wood to mix them thoroughly. A very thick grease will be obtained which will be found excellent for the purpose.

## Making Copper Coated Steel Wire.

The manufacture of compound metals seems to be receiving more attention at the present time than ever before. Byron E. Eldred of Bronxville, N. Y. has patented a new method of making a copper coated steel wire which may be employed as an electrical conductor or for other purposes. The inventor describes the process of making the billet as follows: After the billet has been made it is rolled down to rod and drawn into wire in the usual manner:



The Copper Coated Steel Wire.

"I first produce a core of iron, steel or any of the ordinary 'alloy steels' such as nickel steel, manganese steel, etc., or of the iron-like metals, nickel or cobalt, or their alloys, and this core I film with a less oxidizable high-melting, non-ferrous metal such as copper or brass, preferably melting at a lower temperature than the metal next to be applied. The filming may be done in any way. A galvanic coating film of brass, for example, may be applied to a steel billet intended for making copper-clad ware.

The coated billet is next carefully washed and dried to free it of acid, if any has been employed, care being taken to avoid oxidation. It is next preferably coated with a thin coating of a fusible mineral substance such as borax or zinc chloride. This coating may be applied in solution and the solution dried in place. Borax solution is well adapted for the present purposes since in heating the dried borax film gives off steam and when ultimately fused it has oxide dissolving properties. The evolved steam is an efficient means of displacing air in a later operation.

The flux-coated billet is next introduced into a shell or sheath of the desired coating metal, say copper, platinum, gold or silver. This shell or sheath should be quite hot, and may advantageously be nearly red hot, and of such dimensions that the cold billet can just be introduced therein with the shell hot and expanded.

The assembled core and sheath are next heated. The cold core metal expands and produces a high degree of pressure between itself and the shell. To produce uniformity in this pressure the core and sheath are preferably cylindrical in section but can be of any desired corresponding shapes. Presuming borax to be the flux used, the heat first expels the water of crystallization as steam which effectually dispels all air which may be between the metals to be joined and then liquefies the borax itself. This liquefied borax under the high pressure is expelled longitudinally, the comparatively soft coating metal or linking metal filling all spaces which may be between core and sheath. In using a brass-filmed steel billet within a copper shell, the heating may be carried to a point where the brass becomes liquid; brass melting at a temperature considerably below the melting point of copper. If the assembled core and sheath be heated while lying in a horizontal position, as is usually convenient, and if the sheath be somewhat belled at the ends, as often happens in forcing a tight fitting core into place, a pellet of brass may be laid against the seam at either end, and it will enter capilarily, displacing the fluid flux, [illegible] metals having a tendency to wet each other. After the heating, which may ultimately be carried to the softening point of the coating metal, the metals will be found fused and permanently united, so that the billet may be rolled and drawn. This working may be done while the metal is hot or the billet may be reheated

Copper does not readily unite with iron at its ordinary melting temperature, not readily "wetting" the iron, though at higher temperatures its ability to unite with the iron increases. But in producing a union, temperature and pressure are, to some extent, reciprocal factors, and in the present operation pressure is employed.

Brass unites with iron more readily, particularly those alloys which contain considerable zinc since zinc itself unites readily with iron. Where a brass coated steel billet is expanded within a copper sheath, the pressure much enhances the disposition of the brass to unite with the iron, and since brass readily unites with copper a good union is obtained."

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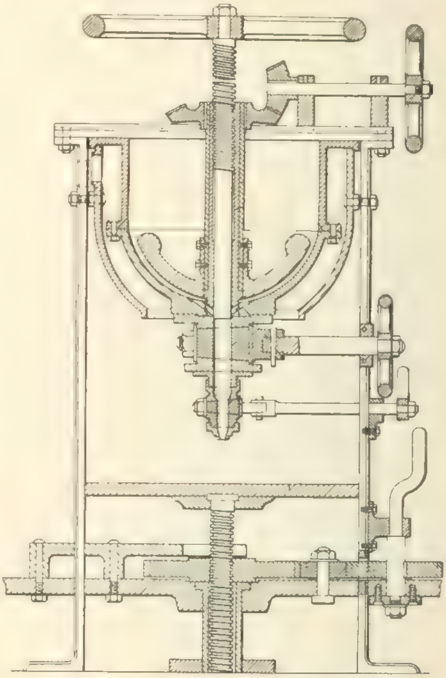
Much of the phorphor-tin on the market sold as "5% phosphor-tin" contains but 2 or 3 per cent of phosphorus.

## A Simple Pressure Casting Machine.

A simple pressure casting machine for use in casting soft metals such as babbitt or low melting metal, has recently been patented by Wm. G. Hanna Jr. of Manchester, England. The metal is melted in an ordinary pot of iron and in this pot is a plunger operated by a bevel gear and screw. This device serves to force the metal out at the orifice in the bottom of the pot. Two cocks in the outlet of the kettle and at the bottom control the flow of metal and prevent its egress until the proper time has arrived.



**Press for Making the Castings.**

The mold to be filled is placed in connection with the outlet at the bottom of the lower cock and on a platen which may be raised or lowered by a screw. The object of this procedure is to bring the mold tight at the outlet and also to permit molds of varying sizes to be used. It is stated that a pressure of 500 lbs. per sq. in. can be obtained with the apparatus.

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Copper wire is an excellent scrap material for the reason that it is very pure. Copper of the highest purity is always used for making wire

## An Apparatus for Refining Lead.

A novel apparatus for refining lead has been patented by J. F. Beattie of Hammond, Ind. and which is herewith illustrated. Use is made of kettles A and A' called "crystallizers" for separating the impurities in the lead in the form of a rich alloy of the impurity and the lead.

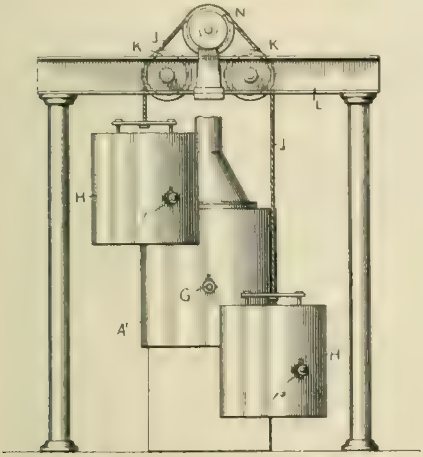

Fig. 1. View of the Apparatus Employed.

The operation is as follows: Presuming that the apparatus is to be used for refining a metal containing .20% Bi. and presuming that the crystallizer A is filled with a metal containing about .20% Bi. and the crystallizer A' contains metal having about .085% Bi., the transferring kettle H is empty, and the transferring kettle H' contains liquid having about .15% Bi. obtained from the crystallizer A' by a previous operation. A crystallization operation is now carried on in crystallizer A. The result of the crystallization operation in the crystallizer A is the formation of crystals containing .15% Bi. and a liquid having .27% Bi. This liquid is run into the transferring kettle H and is then removed from the latter for further working, and the contents of the kettle H' are now transferred into the crystallizer A, so that the latter now contains crystals and a liquid having each the same percentage of bismuth, that is, .15%.

The crystallization operation in the crystallizer A' results in crystals having .063% Bi. and a liquid containing .11% Bi., and this liquid is now tapped into the kettle H'. Another crystallization operation is now carried on in the crystallizer A to produce a liquid having .20% Bi. and crystals containing about .11% Bi. The liquid is tapped into the transferring kettle H. The liquid in kettle H' is next transferred into the crystallizer A which contains crystals of the same grade .11% Bi. The remaining contents of the crystallizer A' containing about .063% Bi. are now tapped into

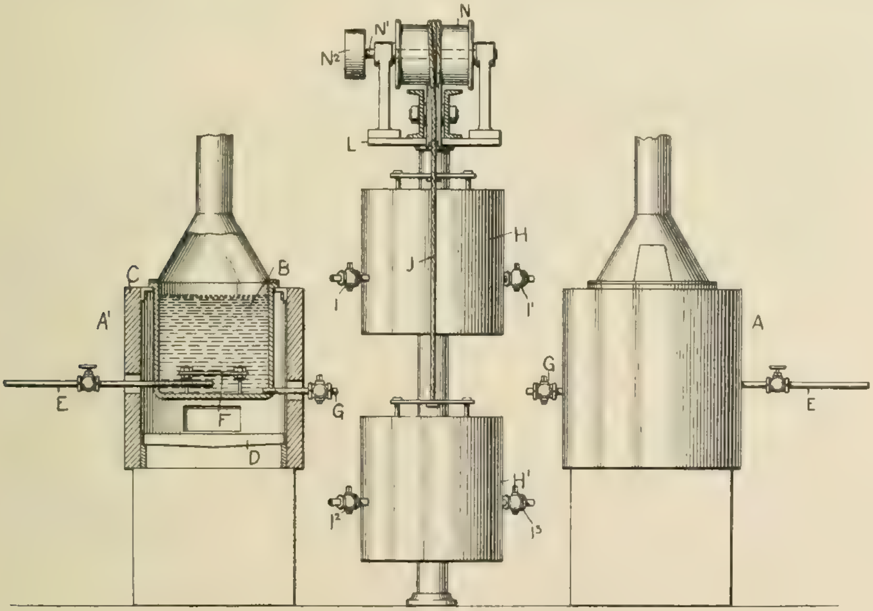

Fig. 2. Cross-Section of the Apparatus.

the transferring kettle H′ and part of this metal is delivered outside as purified lead, but a portion equal to the regular liquid portion is retained in the transferring kettle H′. The liquid containing about .20% Bi. in the transferring kettle H is now tapped into the crystallizer A′ and a new charge of metal also containing .20% Bi. is added to fill the crystallizer A′.

The next crystallization operation carried on in the crystallizer A produces a liquid containing about .15% Bi. and crystals containing about .085% Bi. The liquid is transferred to the transferring kettle H and the contents of the transferring kettle H′ containing about .063% Bi. is tapped into the crystallizer A. A crystallization operation is now carried on in the crystallizer A′ containing a liquid of about .20% Bi., so that a liquid is produced of about .27% Bi. and crystals containing about .15% Bi. The liquid of about .27% Bi. is tapped into the transferring kettle H′ and is removed for further treatment outside of the apparatus. The liquid in the transferring kettle H containing about .15% Bi. is now tapped into the crystallizer A′.

The crystallization operation is now carried on in the crystallizer A to produce a liquid containing about 0.11% of Bi. and crystals containing 0.063% of Bi. The liquid is run into the transferring kettle H while the crystals remain in the crystallizer A. The crystallization operation is now carried on in the crystallizer A′ to produce a liquid containing about 0.20% of Bi., and crystals containing about 0.11% of Bi. The liquid is transferred to the transferring kettle H′ and the liquid from the transferring kettle H′, containing about 0.11% of Bi. is tapped into the crystallizer A′. The liquid of the crystallizer A containing 0.063% of Bi. is now tapped into the kettle H and the liquid contained in kettle H′, and a new charge of metal containing 20% Bi., and in quantity sufficient to fill the crystallizer A is now passed into the latter. A crystallization operation is now carried on in the crystallizer A′ to produce liquid containing about .15% Bi. This liquid goes to kettle H′. Crystallizer A′ now contains crystals with .085% Bi. Part of the liquid in kettle H is put into crystallizer A′ and part delivered as a purified lead. The result is now a condition practically the same as at the beginning and the above-described operation is repeated.

From the foregoing it will be seen that by the operation described, the metal is gradually refined and run off as purified lead and an enriched lead periodically discharged for further treatment, the whole operation being carried on by the use of two crystallizers and two transferring kettles as described.

## Condenser Tube Corrosion.

The work of the Corrosion Committee of the British Institute of Metals has so far been attended with success. The work has been carried out on condenser tubes and a special condenser was built in which tubes were tested. Laboratory experiments were carried out to supplement the work.

The Committee found that a tube composed of 70% copper and 30% zinc is surpassed, as far as dezincification is concerned (and this is the usual cause of failure of tube in practice) by one consisting of 70% copper, 28% zinc and 2% lead, and by those of Admirlaty composition composed of 70% copper 29% zinc and 1% tin. Muntz metal composed of 61% copper and 39% zinc was shown to be unsuited for condenser tubes. The temperature was also found important and failure took place when the temperature became high. A low temperature was required for minimizing the rate of failure.

## A Method of Coloring Aluminum.

A method of coloring aluminum has been patented by Albert Lang of Karlsruhe, Germany and which is as follows:

The aluminum is treated by hydrochloric acid, chloride of copper or chloride of iron and then, without rinsing, is heated. A film is left on the surface which may be lacquered if desired. Hydrochloric acid gives a white coating, chloride of copper a black one and that obtained by chloride of iron is gray. It is stated that an enamel applied over such a coating gives the best results.

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While nickel plating was done before patents were issued to Dr. Isaac Adams, he was the first to carry it on commercially and his success lay in the use of the double sulphate of nickel and ammonia. Before his time other solutions were employed, which did not permit the electrodeposition of nickel in a commercially successful manner.

## A Continuous Process for Molding Sheet Lead.

While sheet lead has been rolled by the so called continuous rolling process, a method for the continuous molding of the sheet has been patented by George W. Dennis of Harvey, Ill. The molten lead is poured in between two rolls, grooved to the depth and width of the desired sheet. A steel belt passing over a second wheel acts as a cover for the groove in the wheel in which the lead is cast.

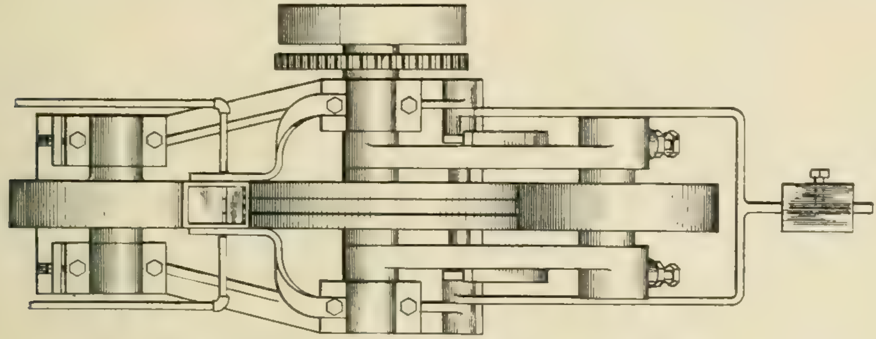


Fig. 1. Top View of the Apparatus for Making Sheet Lead.

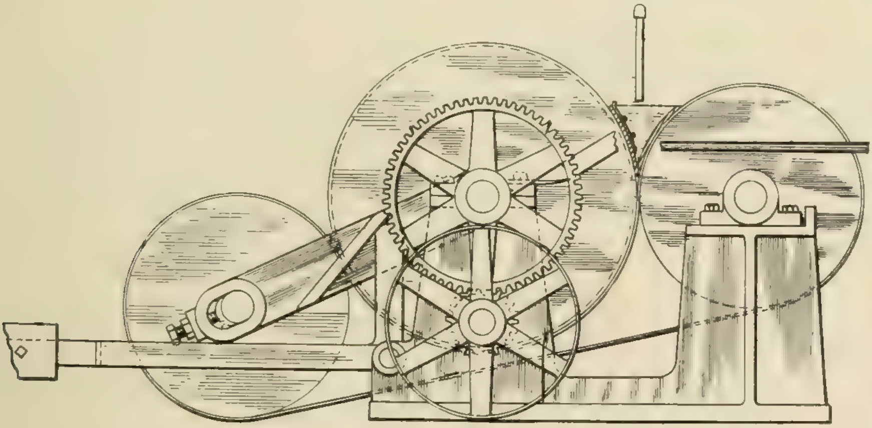


Fig. 2. Upright View of the Apparatus, Indicating the Steel Band Used.

The operation is as follows: The lead is brought to the required or standard temperature and the receiving trough is first heated to the required temperature or to a temperature such that chilling of the metal will be avoided. The metal is then admitted into the trough from the pipe, any suitable valve closely connected with the pot sufficing for this purpose. The metal passes through the opening in said trough into the groove in the die wheel and is promptly cooled by contact with the die wheel and the metal belt and is simultaneously fed forwardly and through the machine and delivered in the form of a sheet ribbon or strip at the rear. Tension is at all times maintained on the belt by the counterweight attachment before described, which acts to elevate the tightener pulley or the band wheel. The construction is such that the machine may be driven at a high rate of speed and the metal sheet ribbon or strip rapidly formed and fed therefrom.

In plating steel cutlery, it can be prevented from rusting after cleaning and before silver plating by immersing in a sal-soda solution.

Aluminum-bronze for castings has not come into but very limited use. Good material that it is, manganese-bronze has driven it almost from the field. The cheapness of the manganese-bronze is the cause of its extensive use.

# Questions and Answers.

QUESTION No. 1392. In the following formula for a nickel solution what is the free acid?

| | |
|---|---|
| Double Nickel Salts ...... | 8 oz |
| Single Nickel Solts ....... | 2 oz. |
| Sal Ammoniac . | 1 oz. |
| Boracic Acid . | 1 oz |

*Answer.* In the preceding formula, the boracic acid is the free acid as the other salts are what is called "neutral."

QUESTION No. 1393. We understand that cadmium is used in silver solders. What is the object of this? We have always made our silver solder from 2 parts of silver and 1 part of sheet brass, but if there is anything better, we would like to know it.

*Answer.* Cadmium is used in silver solders to lower the melting point. Half of the zinc in the mixture is replaced by cadmium. If your solder works well without cadmium, there is no object in using it as it will increase the cost.

QUESTION No. 1394. What acids or solutions dissolve aluminum? We desire to etch some sheet aluminum.

*Answer.* Hydrochloric acid acts on aluminum readily, both when strong and dilute. It is the best solvent. Sulphuric acid acts on it very slowly and nitric acid scarcely at all. Caustic alkalies such as potash or soda also attack and dissolve it. The use of weak muriatic acid will probably be the best for what you want as it will not attack the resist.

QUESTION No. 1395. Kindly give us some information regarding the shrinkage of manganese-bronze sand castings.

*Answer.* The shrinkage of manganese-bronze castings is usually considered about ¼ of an inch to the foot and if you use such a shrink rule, made for this shrinkage, in making the patterns you will not come far out of the way.

QUESTION No. 1396. In plating with our cyanide copper solution we have difficulty in covering the whole surface of the article except after a long time. We cannot use the solution hot and the work is sheet steel. Is there any way to overcome this trouble?

*Answer.* Your solution does not contain sufficient copper. Dissolve some carbonate of copper in cyanide until it will take up no more and add to your solution until you obtain the right deposit. Weak solutions do not deposit their copper readily and this is why copper solutions are often used hot.

QUESTION No. 1397. Is there any method of reducing the shrinkage on manganese-bronze sand castings? If possible, we would like to use such a method.

*Answer.* There is no way. It is the "nature of the beast." All strong metals shrink excessively and this is apparently what renders them strong.

QUESTION No. 1398. Castings I am making come full of pin-holes. They are a heavy hub pattern and I pour with a horn gate on the bottom and the metal is poured dull. After the castings have been turned the pin holes show. Will you let me know what the cause of the pin-holes is. The mixture used for the castings is:

| | |
|---|---|
| Copper . | 45 lbs. |
| Tin .. . | 3 lbs. |
| Lead | 2 lbs. |

*Answer.* Your mixture is the cause. You should either use zinc in it or phosphorus as a bronze without either casts with pin-holes. The object of zinc in a bronze is to remove them. Phosphorus does the same thing. Add 3 lbs. of zinc to every 100 lbs. of your mixture and you will find that your castings come better.

QUESTION No. 1399. What black finish is used on steel? We notice it on hardware and similar steel goods

*Answer.* The finish you mention is probably a black lacquer as this is now used quite extensively on hardware and similar steel goods. You can obtain it from the regular lacquer manufacturers.

QUESTION No. 1400. In THE BRASS WORLD. May 1913 under the title of "A Cheap Soft Solder", a formula is published for a cheap, soft solder containing bismuth. Do you think this a satisfactory material for use on lanterns and similar sheet tin goods which we make?

*Answer.* The solder has been used by tinsmiths but the solder has not yet been given the "test of time". As some solders have a way of disintegrating, it would be advisable to wait untli you have tried it out for some time before using it regularly.

QUESTION No. 1401. I am frequently called upon to silver plate small articles of jewelry which have been enameled. I have plated some that have been entirely satisfactory, but within the past few weeks I have experienced more or less difficulty on acount of the enamel chipping out and taking the silver with it. The metal upon which the enamelling is done is called "rich gilding metal". Can you give the cause of the chipping of the enamel?

*Answer.* This is one of the mysteries of the manufacture of jewelry. As the chipping will occur with some colors and not with others, it is usually assumed that the cause is in the composition of the enamel itself. Further than this we are not prepared to give you any additional information

QUESTION No. 1402. We are making steam metal valves and are troubled by the color after they come from the machine ship. They come from the machines dirty and we desire to obtain a rich, orange color. How can this be done?

*Answer.* You cannot obtain as good a color as that originally on the valves. There are two ways of accomplishing it. First, by sand-blasting the valves. This does not give a color like the original finish, but a clean, uniform one. Second, by means of a dip. This dip is composed of equal parts of oil of vitriol and aqua-fortis. It should be slightly warm to work quickly and evenly. The acid, however, will not work unless the valves are freed from oil and this can be done in a caustic potash or similar cleaning solution. It will also give poor results if there is considerable lead in the valves.

Question No. 1403. Our cyanide copper recently developed a tendency to plate "brassy" and is almost yellow. We desire to bring it back to a normal condition. During the past few months we have plated some quite heavy structural iron, which has, no doubt, taken a large amount of copper out of the solution. We are also constantly, and have for several years past, been plating art glass in zinc bindings in this solution. It has kept us poor buying cyanide and carbonate of copper to keep the solution up and, at present, even the addition of normal quantities of carbonate of copper does not affect the color of the copper deposit. We would like to ask if the solution has taken enough zinc from the bindings to affect the color? Also whether there is any way to remove the zinc without harming the solution? To the best of our knowledge we have plenty of anodes.

*Answer.* Your difficulty has been caused by the zinc entering the cyanide copper solution as there is no way of obtaining a yellow color except by means of zinc. Either the zinc has entered the solution by the dissolving action of the cyanide when it is immersed for plating (zinc is slowly dissolved by alkalies such as potash, soda, cyanide and sal soda) or pieces may have dropped in and this slowly dissolved. It is impossible to remove the zinc by chemical means as it would be very expensive. If you run the solution for some time the zinc will gradually work out, but it apparently contains considerable of this metal and it make take some time. We suggest making up a new solution and to it add a little of the old or enough so that it does not plate brass. More can tthen be added from time to time until all has been used up.

Question No. 1404. Will you inform us what flux is customarily used in the manufacture of German silver to be rolled into sheet?

*Answer.* The only flux that is used in making German-silver is a little common salt. About a handful is put in after the metal has partially melted (that is to a No. 70 crucible). The metal is kept covered with charcoal all the time. Manganese is now extensively used as a deoxidizing material in German-silver and is quite efficacious. About 0.10% of the metal is used.

Question No. 1405. Is there any non-corrosive aluminum alloy that can be cast and which can be used for standing saltwater?

*Answer.* No aluminum alloy stands salt water well and it will soon corrode. The alloys (consisting principally of aluminum, of course) do not appear to stand salt-water better than the pure metal. Under these conditions the aluminum turns white which gradually increases in thickness.

Question No. 1406. Can silver be deposited directly on pearl? If so, please let me know the method of doing it.

*Answer.* Give the pearl a coat of thin spar-composition varnish (use turpentine for thinner) and then, when it becomes "tacky" brush over with the finest copper powder and allow to dry. Then dust off with a camel's-hair brush to remove the excess of the copper powder. Now immerse in an ordinary cyanide silver plating solution for a few seconds and it will be found that the copper will change to silver. Silver plating can now be done direct but it is advisable to connect the article before introducing into the regular silver solution in order to avoid removing the thin pellicle on the surface by dissolving action. Use a cyanide solution of silver containing as little free cyanide as possible. An acid copper solution is the best for the first deposit if you can use it, as it is possible to build up a good thickness with it which can afterwards be silver plated.

Question No. 1407. Can you refer me to anyone selling coke crucibles? I am interested in them.

*Answer.* We do not know of anyone making a crucible of this nature, neither do we know of anyone using such a crucible. Old text books on metallurgy mention such crucibles, but we do not believe they are employed to-day. Graphite crucibles and those made of clay are the ones almost entirely used.

Question No. 1409. We are making castings of an aluminum alloy called No. 12 and which contains, 92% aluminum and 8% of copper. The trouble we experience is that the castings crack in the mold. What we want to know is whether there is any other mixture that will crack less?

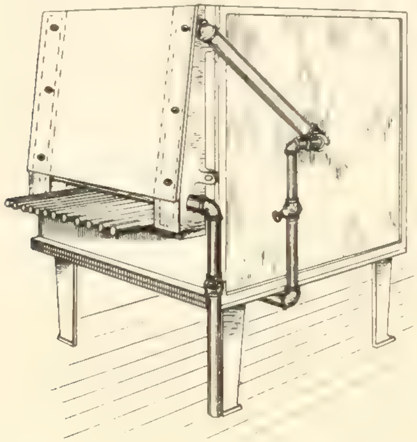
*Answer.* The aluminum and copper alloy cracks much less than any other alloy and is considered the best for general casting purpose. The other casting alloys contain zinc and will give you much greater trouble, as far as cracking is concerned, than the aluminum and copper alloy. They are, however, a little stronger and this is why they are used.

Question No. 1412. What is the best flux for tinning steel? We have been using hydrochloric acid but it does not work well.

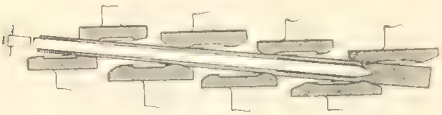
*Answer.* The best flux is chloride of zinc, made by dissolving zinc in muriatic acid (hydrochloric acid) so that no free acid remains. Use it strong and allow the acid to act upon an excess of zinc until all used up so that no free acid will remain. There is nothing that will take the place of chloride of zinc as a flux in tinning and there is nothing as good.

# Patent Abstracts.

1,079,266, Nov. 18, 1913. PREHEATER AND FURNACE SHIELD. Walter S. Rockwell of New York City. The invention relates to furnaces for heating metal for forging, bending, annealing, hardening, etc. Such furnaces must be made with an open end and use is made of this fact to provide a "shield" which not only protects the operator of the furnace, but also serves to preheat the air that is used for the combustion of the fuel and thereby producing more satisfactory combustion. A series of pipes passing inside of the "shield" accomplishes this.

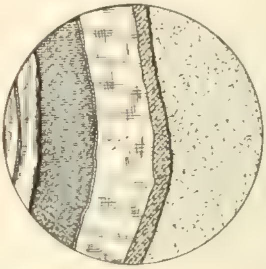


1,077,014, Oct. 28, 1913. PROCESS AND APPARATUS FOR PIERCING AND ROLLING TUBES. Ralph Charles Stiefel of Ellwood City, Pa. A process for piercing solid billets and rolling them into tubes. The object in this invention is to pierce and roll the tube in one operation without the loss of heat. Heretofore it has been customary to pierce the billet in one operation and then roll the tube in another, making two operations but in this method, the whole process is carried out in one operation.



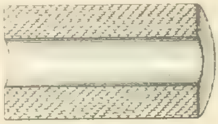
1,078,176, Nov. 11, 1913. WIRE WIPING APPARATUS. A device for wiping wire after it has been galvanized. It consists of a pair of gears containing fingers which come in contact with the wire as it issues from the galvanizing bath.

1,077,143, Oct. 28, 1913. ABRADING DISK. Carl Krug of Frankfort-on-the Main, Germany. A flat-disk of metal, a layer of fabric, a layer of binding agent, a layer of abrading material and a layer of rubber of a very thin nature made by dissolving it in a solvent before applying.



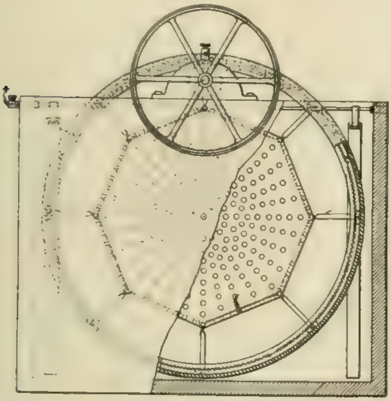
1,077,696, Nov. 4, 1913. WORKING TUNGSTEN. Carl T. Fuller of East Orange, N. J. Assignor to The General Electric Company. In working tungsten by drawing, swaging, etc., the metal frequently becomes brittle on account of the outside layer. The patent relates to the removal of this hard skin. The method employed is to treat with fused nitre, sodium carbonate or barium chloride, or to "back off" electrolytically in a potassium hydroxide solution.

1,076,941, Oct. 28, 1913. SELF-LUBRICATING WOOD BEARING AND SURFACE. Leigh S. Bache of Bound Brook, N. J. Assignor to the Graphite Lubricating Company of the same place. The patent applies to a method of treating wood for use as a bearing material. The wood is impregnated with a compound of a hydrocarbon, wax, stearic acid and a coloring matter.

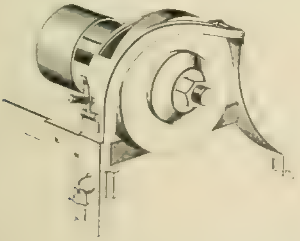


1,079,079, Nov. 18, 1913. PROCESS FOR THE PREPARATION OF METALLIC MAGNESIUM. Roger William Wallace and Eugene Wassmer of London, England. The method consists in electrolyzing a fused bath of the chloride and sulphide of magnesium, then adding a flux of fluor-spar or similar material to agglomerate the magnesium and then draw off the fused metal.

1,077,646, Nov. 4, 1913. ELECTROPLATING DEVICE. Louis Schulte of Chicago, Ill. Assignor to the Bennett-O'Connell Company of the same city. An electroplating machine of the barrel type for plating a large quantity of small articles at the same time, and also to allow the cleaning, rinsing and drying to take place with one succession of operations without necessitating the removal of the goods at each step. This is accomplished by removing the barrel in which the goods are placed and immersing it in a succession of tanks for the cleaning, rinsing, plating and drying.

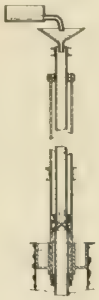


1,079,180, Nov. 18, 1913. GUARD FOR EMERY WHEELS. Charles F. Landoldt of Youngstown, Ohio. A device for use on emery or other abrasive wheels so that, should they break while in use, the operator will not be injured. The appliance is made so that it is easily applied and can be adjusted to the wheel. The construction may be easily understood from the illustration.

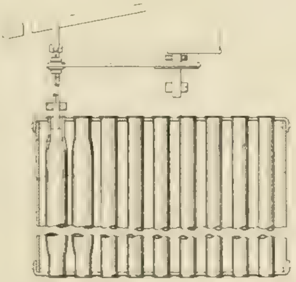


1,078,062, Nov. 11, 1913. TREATMENT OF RENOVATION OF FOUNDRY SAND. Andrew Poulson of Farnworth, Widnes, England. A process of renovating foundry sand which has become so burned that it has lost its cohesion. The sand is treated with a mixture of equal parts of sulphate of aluminum, sulphate of magnesium and water.

1,078,387, Nov. 11, 1913. APPARATUS FOR LINING TUBES WITH LEAD, TIN AND THE LIKE. Paul Theuerkorn of Chemnitz, Germany. The process is applied more particularly to the lining of copper tubes with lead or tin. The tube is placed over a core, a collar or flange closing the space between the tube and core. The core is then moved while the metal is poured in. In other words, the core is moved upwards while the tube is being lined and thus a uniform coating of metal is obtained.



1,078,583, Nov. 11, 1913. PROCESS OF HARDENING COPPER BOILER TUBES. Philip D. Johnson of Chicago, Ill. The process is applied to hardening either copper or brass tubes used in boilers and consists in first subjecting the tubes to pressure to cause them to collapse and then restoring them to circular cross section and hardening them by a rotating spinning tool. Applied to old tubes,



1,078,525, Nov. 11, 1913. REFRACTORY MATERIAL. Frank J. Tone of Niagara Falls, N. Y. Assignor to the Carborundum Company of the same place. The invention relates to the manufacture of a refractory material for use as furnace lining. It is composed of a face of silicon carbide of a high refractability and of low thermal resistivity and a backing of a silicon carbide of low density and high thermal resistivity.

# Trade Items.

The F. S. & D. Manufacturing Company has been incorporated in Syracuse, N. Y. for the manufacture of brass and aluminum goods. The incorporators are James W. Farrar, Allen H. Amith and George H. Deas.

The new addition to the plant of the Natlional Screw & Tack Company of Cleveland, Ohio, has been completed. It is five stories high and 40 x 200 feet. It will be used for regular manufacturing purposes.

The Argus Smelting Company, makers of ingot brass and composition, have removed their general offices from Brooklyn to New York City. They are now located in the Marbridge Building, 47 West 34th. St., New York City.

The Carboy Inclinator Company, 1269 Broadway, New York City, makers of appliances for tilting carboys, will have an exhibit at the International Exposition of Safety and Sanitation at the Grand Central Palace in New York City, Dec. 11th. to Dec. 20th. They will be located in Space 100.

The following officers have been elected at the meeting of the stockholders of the U. S. Auto Lock Company, recently organized in Findlay, Ohio: President, E. B. Brokaw; secretary, R. J. Harahan; and treasurer, E. C. Edwards. It is reported that the locks will probably be manufactured in Toledo.

The Lignum Chemical Works, Meeker Ave., and Van Dam St., Brooklyn, N. Y., are now placing on the market a green sweeping compound which is being used in factories, stores and public buildings for preventing dust when floors are being swept. It cleans the floor by abrasion and also acts as a deodorant and disinfectant at the same time.

A plant is being erected by the Imperial Metal Products Corporation at Keene, N. H., who will manufacture a new type of metal furniture. Patents have been obtained upon the method of making the furniture by S. C. Entwistle, the general-manager of the company. The main building of the new plant will be 61 x 255 feet and four stories high. There will also be an annex 18 x 60 feet. The company was recently organized with a capital stock of $500,000.

The B. O. Bowers Company, 136 Liberty St., New York City, the importers of "Persels" the new and valuable nickel salts, have installed in their plant in New York a solution for producing heavy brass deposits in a commercial and practical way. They claim that these deposits are superior to close-plating and it is possible, by this solution to obtain brass deposits of great thickness. They are also demonstrating their new electrogalvanizing solution and extend invitation to platers to inspect their experimental plant in which these interesting and valuable processes are carried out.

The Max Deutz Company has been incorporated in Providence, R. I. for the manufacture of jewelry. The capital stock of the company is $50,000. This is a reorganization of the old concern conducted by Mas Deutz.

The Pope Mfg. of Hartford, Conn., manufacturers of bicycles, motorcycles and automobiles, have transferred all the bicycle manufacture from Hartford to Westfield, Mass. where the bulk of the business has been carried on in the past.

The Providence Gold Stock Company has been organized in Providence, R. I. to make a line of 10 karat gold jewelry. The company is being organized by N. E. Palter of 198 Broad St. and who will shortly incorporate the company. A standard line of jewelry will be manufactured.

The Winchester Repeating Arms Compuany of New Haven, Conn., have 7 Schwartz melting-furnaces for sale, six of which are of Class A No. 3, 2000 lbs. capacity and one is Class A. No. 2, 500 lbs. capacity. They are complete with all appliances and will be sold separately or as a lot.

The Edmonton Electro Plating Company of Edmonton, Alta. Canada have completed their plant and started in business with an up-to-date equipment. A general line of job plating, polishing and lacquering will be carried on. The location is at 786 Jasper Ave. East and the company consists of L. Davies and J. Hutchen.

The American Die Casting Company have started in business at 375 Kent Ave. Brooklyn, N. Y., and are making high-grade die castings for the trade. They will gladly make quotations on any shape that can be cast and a specialty is made of handling difficult problems. The officers of the company are: President, E. Mayer; vice-president, J. Schultz; and treasurer, J. Kradlaw.

The Heath & Heilman Mfg. Co., have started in the manufacture of carriage and hearse lamps in the Crawford Building, Fairfield Ave. and Courtland St., Bridgeport, Conn. The company is composed of Joseph E. Heath and Frank Heilman, both of whom have been connected with the White Mfg. Co. of Bridgeport, Conn. for a number of years. Silver plating will be carried on later.

The Hanson & Van Winkle Company of Newark, N. J. call attention of the plating trade to their "Kostico" for use in cleaning grease and oil from metal goods previous to plating, dipping or lacquering. This material is a dry, granular salt which can be handled without waste and, making a clear solution, there is no scum to cling to the work. It is particularly recommended for small work that has been machined, such as bolts, nuts or screws and upon which there is mineral-oil. "Kostico" does not affect soldered joints. One-half pound is dissolved in a gallon of water

C. P. Higgins & Co., 9 Willow St., Newark, N. J., manufacturers of fountain pens, have moved to Caldwell, N. J.

It is reported that the United Wire & Supply Company of Providence, R. I. will build a new plant at Cranston, R. I., a neighboring town.

The Headlight Support Company has been incorporated in Detroit, Mich. with a capital stock of $50,000 and will manufacture automobile accessories.

The Frank L. Michaels Company of Cincinnati, Ohio are to move their plant from that city to Covington, Ky. where a building has been obtained at Scott & Third Sts. This company is now operating a brass foundry.

The American Metal Stamping Company of Philadelphia, Pa. have gone into the hands of a receiver and W. S. Lloyd and Frank E. Sagendorph have been appointed to the position.

The Willour Mfg. Co. has been incorporated in Ashland, Ohio with a capital stock of $30,000 to manufacture plumbing goods. A brass foundry is to be started and the manufacture of special flushing valves is to be carried on.

A factory is to be established in New Bedford, Mass. by the Blake Hydraulic Valve Corporation, manufacturers of self-closing faucets, etc. The officers of the company are: President, E. B. Wadsworth of Boston; and treasurer, George A. Blake of New Bedford.

The Zouri Drawn Metals Company of Chicago, Ill., manufacturers of sheet metal for store fronts, windows, etc., have purchased a site in Waukegan, Ill. and will erect a $50,000 plant on it. The main building will be 127 x 300 feet. The company is now located at 38 South Dearborn St. The product of the company is principally of copper.

The Corbin Automatic Products Company has been organized in New Britain, Conn. and will take over a portion of the business of the Corbin Screw Corporation's business. The coaster-brake, speedometer and special products will be made by the new company and Clarence A. Earl will be the new manager of the company. A new six-story building is to be used for the manufacturing. The Corbin Screw Corporation will now be conducted separately and business will be confined to screw machine products.

George S. Youngs, Housatonic Ave. and Stella St., Bridgeport, Conn., manufacturer of ingot metals, is now making a high grade copper ingot by a special process from pure copper wire. It is well known that copper wire is the purest form of copper to be obtained in commerce but the ordinary brass founder is unable to melt it without oxidation, particularly in the small sizes. Mr Youngs has evolved a special process for melting the wire so that no oxidation takes place and the ingot copper is the equal of the best Lake brands and far superior to the ordinary casting copper in purity.

The Reynolds Electric Mfg. Co. of Chicago, Ill. are to erect a new factory at 428 South Talmon Ave in that city. The cost is estimated to be $20,000.

The Coe Brass Company of Torington, Conn. are to erect a new casting shop at their works in that city. The shop will not be started at present on account of business conditions.

It is stated that the order recently received by the Gorham Mfg. Co. of Providence, R. I. for the silverware for the new Hotel Biltmore of New York City, will amount to practically $100,000.

The Richardson Scale Company which was recently incorporated in Bridgeburg, Ont. Canada wit a capital stock of $50,000 will build a factory in that city. The manufacture of scales will be carried on and the incorporators are John A. McIntosh, Frederick W. Scott, J. A. Gibson and W. C. LaMarsh.

The production of the Harris Typewriter Company of Fond-du-Lac, Wis. will, after January 1st, be increased to 25 machines per day. This is due to a large order obtained from Sears, Roebuck & Co. of Chicago, Ill. the large mail order house. It is expected that about 250 hands wil be employed.

Thomas J. Curtin of New Britain, Conn. and for many years superintendent of the Corbin Screw Corporation of that city, has identified himself with a new company called the Canadian Screw & Wire Co. which will establish works in Canada. The capital stock of the new company is $500,000 and a $150,000 plant will be built.

William Jacobus has opened an office at 38 Park Row, New York City and will carry on a business as scrap metallurgist and salvage expert. This is a unique profession and, it is believed, Mr. Jacobus is the first one to engage in this business. He was formerly scrap expert for the United States Navy Department and has had much experience in handling scrap materials.

The Bi-Gas Flux Company has been organized and are operating a small plant in Bridgeport, Conn., for the manufacture of fluxes for brazing and brass founding. A building has been obtained at George and Center Sts. and two Steele-Harvey furnaces have been installed. William Rodman, formerly connected with the Locomobile Company of Bridgeport, Conn. is identified with the company.

The Lewis Motor Car Company has been organized in Racine, Wis. by William Mitchell Lewis, formerly of the Mitchell-Lewis Motor Car Co. Space has been obtained in that city in the buildings formerly occupied by the Racine-Sattley Company and manufacturing has been commenced. It is expected that cars will be ready for delivery by February 1st. The vice-president of the company is Rene Petard, formerly designer for the Mitchell-Lewis Company who came from France for that purpose

The plant of H. Gardner, 109 Oliver St., Newark, N. J. is to be enlarged. The spinning of silver and other metals is carried on.

The Eagle Iron & Brass Foundry of San Diego, Cal. have purchased the foundry of G. W. Simpson of that city.

Von Steiner & Baumgartner have started to manufacture jewelry at 1110 F St., Washington, D. C. Order and platinum work will be made a specialty.

The Bundy-Goebel Mfg. Company has been incorporated in Detroit, Mich. with a capital stock of $10,000 to manufacture specialties of aluminum and brass.

A new machine shop, 90 x 120 feet, is to be built by the Schutte & Koerting Company, 12th and Thompson Sts. Philadelphia, Pa., manufacturers of injectors, valves and other steam goods.

The International Telephone Meter Company has been organized in Webster City, Iowa with a capital stock of $1,000,000 for the manufacture of a telephone meter This meter is the invention of E. H. Martin of the Martin Telephone Company.

The Struthers Mfg. Co. has been incorporated in Peoria, Ill. with a capital stock of $200,000 for the manufacture of lightning rods and hardware specialties. The incorporators are Reuben F. Struthers, John H. Owens and Arthur M. Ottman.

Announcement is made by O. Yampolsky, scrap metal dealer of Pittsburgh, Pa. that he has now become a citizen of the United States and, his name being difficult to pronounce, he has changed it to J. L. Paul under which he will continue business.

The C. S. Bush Company of Attleboro. Mass. dealers in manufacturing jewelers supplies, have received a large order from Japan for fig-soap for use in cleaning metal goods. This soap is used in place of whale-oil soap for the reason that it has no odor.

The Goldschmidt Thermit Company, 90 West St., New York City are now supplying the trade with their pure manganese metal which contains from 98 to 99 per cent. pure manganese. This is free from carbon, iron and other impurities and is supplied in convenient size for alloying with the brasses and bronzes, German-silver, nickel-alloys, aluminut, etc. This company also make a number of other pure metals such as chromium, and its alloys, copper-cobalt, etc.

The International Chemical Company of Camden, manufacturers of cleaning compounds and alkalies for the plating and metal trades, are now making a material for removing grease and oil from machined work such as screws, bolts, nuts, rivets, etc., that are to be left without plating. Ordinary alkalies leave the goods in a chemically clean condition and free to rust, but this new material cleans the goods and leaves a slight film of oil on the surface making the surface practically rust proof.

The South Bend Watch Company of South Bend, Ind. has been reorganized under the laws of Indiana and with a capital stock of $200,000. The incorporators are Samuel Parker, S. J. Crumpacker and W. G. Crabill.

A factory for the manufacture of 10 karat gold jewelry has been started by Theodore Schanbacher at 67 Hamilton St., Newark, N. J. The manufacture of scarf-pins will be carried on at first.

The B. J. Rliey Company of Newark, N. J., manufacturers of metal novelties, have moved their factory to 251 Railroad Ave. where larger facilities for manufacturing are now had.

The St. Thomas Bronze Company, Ltd. has been incorporated in St. Thomas, Ont. Canada with a capital stock of $200,000 to manufacture brass and bronze castings. The incorporators are Maurice Aleander, Colville Sinclair and a number of others of Montreal.

It is reported that a large plant for the manufacture of automobiles will be erected at St. John, New Brunswick, Canada by the Ford Motor Company. This plant will, it is stated, take care of the trade in Eastern Canada.

The Northwestern Brass, Ltd. has been incorporated in Winnipeg, Manitoba, Canada with a capital stock of $1,000,000 to manufacture brass and bronze castingss. The incorporators are G. C. Jones and P. R. Diamond of Montreal, Canada.

The Eureka Brass Mfg. Company of St. Louis, Mo. have purchased a tract of land near the Terminal Railroad in North St. Louis and will build a large brass foundry on it. This company makes a specialty of railroad work and babbitt metals

A new building formerly occupied by the Covert Motor Vehicle Works of Lockport, N. Y. has been purchased by the E. H. Ferree Company of that city and it is being equipped for manufacturing. The E. H. Ferree Company manufacture aluminum novelties and were among the first in the United States to engage in this business.

The Paragon Brass Mfg. Co. of Cleveland, Ohio, has been incorporated with a capital stock of $100,000 to take over the business of the Sanitary Company, manufacturers of plumbers' brass goods. The new company will make the same line of goods. The offices of the company are at 1221 Superior Ave. The new officers are: President, H. H. Hackman; secretary, H. J. Geurinck; and treasurer, R. C. Koblitz.

The name of the William F. Renziehausen Company of Newark, N. J., the well known refiners and gold and silver smelters, has been changed to the Renziehausen Company and the capital stock has been increased from $50,000 to $250,000. The business will be enlarged. The manufacture of sheet sterling and fine silver is carried on in addition to the smelting and refining of gold and silver. The company is located at 43 Oliver St

The capital stock of the Premier Motor Mfg. Co. of Indianapolis, Ind., manufacturers of automobiles, has been increased from $200,000 to $700,000.

An addition to the plant of the Bristol Brass Company at Forestville, Conn. will be made. It will be used for annealing furnaces and will be 100 x 100 feet.

The name of the Metal Manufacturing & Supply Company of Pittsburgh, Pa. has been changed to the Pittsburgh Knife & Forge Company.

The Computing Appliance Company of Dayton, Ohio, recently incorporated with a capital stock of $200,000, will, it is reported, shortly build a plant in that city.

The Canadian Bronze, Ltd. of Montreal, Canada have incorporated their business with a capital stock of $2,000,000. Among the incorporators are P. R. Diamond and G. C. Jones.

Ahr & Day of Newark, N. J. have moved their works to 9 Willow St.. The manufacture of brass novelties is carried on and later aluminum goods, it is stated, will be manufactured.

The Quigley Furnace & Foundry Company of Springfield, Mass. have removed their general sales and engineering offices to 105 West 40th. St. New York City from which their sales will be conducted.

The Eagle Polishing & Nickel Plating Company, 59 Warren St., Newark, N. J., job platers and polishers, have gone out of business. The proprietors were Joseph Tusco, Joseph Tusco Jr. and Charles Mauna.

The Standard Galvanizing Company has been organized in Chicago, Ill. and will carry on a galvanizing and manufacturing business. J. G. Goodhue, 538 South Clark St. is one of the organizers of the company.

The Keystone Lantern Company of Germantown, Philadelphia, Pa., manufacturers of lanterns, have purchased a site at Tacony and Collman Sts., Tacony, Philadelphia, Pa. and will ultimately erect an extensive plant on it.

The Jahnke Welding & Supply Company of San Francisco, Cal. are placing on the market a new type of welding and brazing torch which can be used with either acetylene or coal gas and which is also supplied with interchangeable tips. A special aluminum valve is used on the torch which enables the gases to be regulated with one hand.

The Hauk Mfg. Co. of Buffalo, N. Y. has succeeded the McCue Company of that city, manufacture of wire wheels, automobile axles and transmissions. The new corporation takes over the plant and business of the old company and in addition the manufacture of wire spokess will be carried on. The works are at Elmwood Ave. and Grote St. The incorporators of the new company are G. W. Houk of Overbrook, Pa. and E. M. Mills and C. H. McCullough of Buffalo. The company carries on nickel plating.

The capital stock of the Art Stove Company of Detroit, Mich., manufacturers of stoves, has been increased from $350,000 to $500,000.

The New Brass Works has been incorporated in Detroit, Mich. with a capital stock of $4,000 to manufacture brass specialties. The incorporators are John B. Schmandt, Hugh T. McClune and Henry Levitt.

The Kerite Insulated Wire & Cable Company of Seymour, Conn., manufacturers of insulated copper wire, are to erect an addition to their factory and which will be 65 x 150 feet, three stories high.

The capital stock of the Milwaukee Motorcycle Company, 834 Muskego Ave., Milwaukee, Wis. has been increased from $12,000 to $50,000 and the manufacture of motorcycle trucks is to be carried on within a short time.

The Stieff-Ruckle Company of Baltimore, Md. have succeeded the Stieff-Pauly Company of that city. They are now located at 282 West Fayette St., but, it is stated, will obtain larger quarters. The concern manufactures a line of sterling silver goods.

The Empire Art Metal Company has been incorporated in College Point, N. Y. with a capital stock of $250,000 to manufacture hollow metal doors, windows and similar articles. A plant is being erected. John W. Rapp is the president of the company.

The Capital stock of the Flour City Ornamental Iron Works of Minneapolis, Minn. has been increased from $500,000 to $1,500,000. Ornamental iron and bronze work such as grilles, elevator enclosures and bank fittings are manufactured by this company.

The United Metal Mfg. Co. of New York City,manufacturers of brass goods, are to move their plant and busines to Norwich, Conn. where they will occupy the buildings recently vacated by the Sterling Machine Compnay.

The American Cash Register Company of Columbus, Ohio is now engaged in moving its plant from that city to Saginaw, Mich. where a new plant has been built. It is stated that very little new machinery will be required at the new plant.

## Personal.

Elwood Haynes of Kokomo, Ind. delivered an address on "Stellite" before the Engineers Clug of Cincinnati, Ohio on Nov. 20th. This material is the new alloy of cobalt and chromium and surpasses the best steel in cutting power.

W. M. Corse, works-manager of the Lumen Bearing Company of Buffalo, N. Y. has resigned his position with that company and will become general-manager of the Empire Smelting Company of Depew, N. Y. on January 1st. 1914. H. P. Parrock, sales-manager of the Lumen Bearing Company will assume the position of works-manager, combining it with that of his present position.

# Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

| | | |
|---|---|---|
| Acetone, pure 98-99% | lb. | .22 |
| Acid, Acetic, pure 30% | lb. | [illegible] |
| Acid, Arsenious (White Arsenic) | lb. | .10 |
| Acid, Benzoic | lb. | .55 |
| Acid, Boracic (Boric) pure | lb. | [illegible] |
| Acid, Hydrochloric, see Acid, Muriatic. | | |
| Acid, Hydrofluoric, 30% | lb. | .04 |
| Acid, Hydrofluoric, 52% | lb. | .10 |
| Acid, Muriatic, 20° | lb. | .02 |
| Acid, Muriatic, c. p. 20° | lb. | [illegible] |
| Acid, Nitric, 38° | lb. | [illegible] |
| Acid, Nitric, 40° | lb. | [illegible] |
| Acid, Nitric, 42° | lb. | [illegible] |
| **Acid, Nitric, c. p.,** | lb. | .08 |
| Acid, Sulphuric, 66° | lb. | [illegible] |
| Acid, Sulphuric, c. p. | lb. | .06 |
| Alcohol, Wood | gal. | [illegible] |
| Alcohol, Denatured | gal. | [illegible] |
| Alum | lb. | .04 |
| Aluminum, Metallic, in Ingot | lb. | [illegible] |
| Aluminum Sulphate | lb. | [illegible] |
| Aqua Fortis, see Acid, Nitric. | | |
| Ammonia Water (Aqua Ammonia), [illegible] | lb. | [illegible] |
| **Ammania Water (Aqua-Ammonia), 26°** | lb. | .06¼ |
| Ammonia Water, c. p. | lb. | .08 |
| Ammonium Carbonate, lump | lb. | [illegible] |
| Ammonium Chloride (Sal Ammoniac) | lb. | [illegible] |
| Ammonium Hydrosulphuret | lb. | [illegible] |
| Ammonium Sulphate | lb. | [illegible] |
| Ammonium Sulphocyanate | lb. | [illegible] |
| Amyl Acetate | gal. | [illegible] |
| Antimony | lb. | [illegible] |
| Arsenic, Metallic | lb. | .10 |
| Arsenic, White (Acid Arsenious) | lb. | [illegible] |
| Argols, White (Cream of Tartar) | lb. | [illegible] |
| Asphaltum, Commercial | lb. | [illegible] |
| **Asphaltum, Egyptian (Bitumen)** | lb. | [illegible] |
| Benzine | gal. | [illegible] |
| Benzol, Pure | gal. | [illegible] |
| Bismuth, Metallic | lb. | [illegible] |
| **Bitumen, see Asphaltum.** | | |
| **Blue-Vitrol, see Copper Sulphate.** | | |
| Borax, Crystals or Powdered | lb. | [illegible] |
| Borax Glass | lb. | [illegible] |
| Cadmium, Metallic | lb. | [illegible] |
| Carbon, Bisulphide | lb. | [illegible] |
| Calcium Carbonate (Precipitated Chalk) | lb. | .10 |
| Chrome Green | lb. | [illegible] |
| Copper, Lake, carload | lb. | [illegible] |
| Copper, Lake, cask | lb. | [illegible] |
| Copper, Electrolytic, cask | lb. | [illegible] |
| Copper, Electrolytic, carload | lb. | .14½ |
| Copper, Casting, carload | lb. | .14¼ |
| Copper, Casting, cask | lb. | [illegible] |
| Copper Acetate (Verdigris) | lb. | [illegible] |
| Copper Carbonate | lb. | [illegible] |
| Copper Sulphate (Blue Stone) | lb. | [illegible] |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream Tartar, see Potassium Bitartrate. | | |
| Crocus | lb. | [illegible] |
| Cyanide, see Potassium Cyanide. | | |
| Dextrin | lb. | [illegible] |
| Emery Flour | lb. | .04 |
| Emery, F. F. & F. F. F. | lb. | [illegible] |
| Flint, powdered | lb. | [illegible] |
| Fluor-Spar | lb. | [illegible] |
| Fusel Oil | gal. | [illegible] |
| Gold Chloride | oz. | 11.75 |
| Gold, Pure | oz. | 20.67 |
| Gum, Copal | lb. | [illegible] |
| Gum Guiacum | lb. | [illegible] |
| Gum Mastic | lb. | [illegible] |
| Gum Sandarac | lb. | [illegible] |
| Gum Shellac, brown | lb. | [illegible] |
| Gum Shellac, white | lb. | .60 |
| Iridium | oz. | [illegible] |
| Iron Perchloride | lb. | [illegible] |
| Iron Sulphate (Copperas) | lb. | [illegible] |
| Lead Acetate (Sugar of Lead) | lb. | [illegible] |
| Lead, Pig | lb. | [illegible] |
| Lead, Red | lb. | .12 |
| **Lead, Yellow Oxide (Litharge)** | lb. | .12 |
| Liver of Sulphur, see Potassium Sulphide. | | |
| Manganese, Peroxide | lb. | .10 |
| Manganese, Metallic, pure | lb. | .75 |
| **Magnesium, Metallic** | lb. | [illegible] |
| Mercury Bichloride (Corrosive Sublimate) | lb. | 1.12 |
| Mercury, Metallic (Quicksilver) | lb. | [illegible] |
| Mercury Nitrate | lb. | [illegible] |
| Mercury Oxide, yellow | lb. | [illegible] |
| Nickel and Ammonium Sulphate (Double Salts) | lb. | [illegible] |
| Nickel Carbonate, dry | lb. | [illegible] |
| **Nickel Chloride** | lb. | .50 |
| Nickel Metallic | lb. | .45 |
| **Nickel Sulphate (Single Salts** | lb. | .20 |
| Nitre (saltpetre), see Potassium Nitrate. | | |
| Oil of Vitriol, see Acid, Sulphuric. | | |
| Paraffine | lb. | [illegible] |
| Phosphorus, yellow | lb. | .40 |
| Phosphorus, red | lb. | 1.10 |
| Pitch | lb. | .05 |
| Plaster of Paris, Dental | bbl. | 4.00 |
| Platinum Chloride | oz. | [illegible] |
| Platinum, Metallic | oz. | 44.00 |
| Potash by Alcohol in sticks | lb. | .45 |
| Potash, Caustic | lb. | .06 |
| Potassium Bichromate | lb. | .14 |
| Potassium Bitartrate (Cream of Tartar) | lb. | [illegible] |
| Potassium Carbonate (Pearlash) | lb. | .10 |
| Potassium Chlorate | lb. | .15 |
| Potassium Cyanide | lb. | .25 |
| Potassium Iodide | lb. | [illegible] |
| Potassium Nitrate (Nitre or Saltpetre) | lb. | .10 |
| Potassium Permanganate | lb. | .17 |
| Potassium, Red Prussiate | lb. | .55 |
| Potassium, Yellow Prussiate | lb. | [illegible] |
| Potassium Sulphide (Liver of Sulphur) | lb. | .15 |
| **Potassium Sulphuret, see Potassium Sulphide** | | |
| Potassium Sulphocyanate | lb. | [illegible] |
| Pumice, Ground | lb. | .05 |
| Quartz, Powdered | lb. | .01 |
| Rosin, Yellow | lb. | [illegible] |
| Sal Ammoniac, see Ammonium Chloride. | | |
| Sal Soda, see Sodium Carbonate. | | |
| Silver Chloride, dry | oz. | .75 |
| Silver, Cyanide | oz. | 1.00 |
| Silver, Fine | oz. | [illegible] |
| Silver Nitrate, crystals | oz. | .50 |
| Soda Ash | lb. | [illegible] |
| Sodium Biborate, see Borax. | | |
| Sodium Bisulphite | lb. | [illegible] |
| Sodium Carbonate (Sal Soda), crystals | lb. | .02 |
| Sodium Hydrate (Caustic Soda) | lb. | [illegible] |
| Sodium Hydrate (Caustic Soda) by Alcohol in sticks | lb. | .45 |
| Sodium Hyposulphite ("Hypo") | lb. | .04 |
| Sodium Metallic | lb. | .90 |
| Sodium Nitrate | lb. | [illegible] |
| Sodium Phosphate | lb. | [illegible] |
| Sodium Silicate (Water Glass) | lb. | .04 |
| **Soot, Calcined** | lb. | .15 |
| **Spelter, see Zinc.** | | |
| Sugar of Lead, see Lead Acetate. | | |
| Sulphur, Brimstone, in rolls | lb. | .05 |
| Tin Chloride | lb. | [illegible] |
| Tin, Metallic | lb. | [illegible] |
| Turpentine, Venice | lb. | [illegible] |
| Verdigris, see Copper Acetate. | | |
| Water, Distilled | gal. | .15 |
| Water Glass, see Sodium Silicate. | | |
| Wax, Beeswax, yellow | lb. | .45 |
| Wax, Carnauba | lb. | .70 |
| Whiting (Ground Chalk) | lb. | .02 |
| Zinc, Carbonate, dry | lb. | .12 |
| Zinc, Chloride | lb. | .12 |
| Zinc, Sulphate | lb. | .06 |
| Zinc, Spelter | lb. | [illegible] |

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VOL. IX
1913

JANUARY TO DECEMBER
(INCLUSIVE)

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